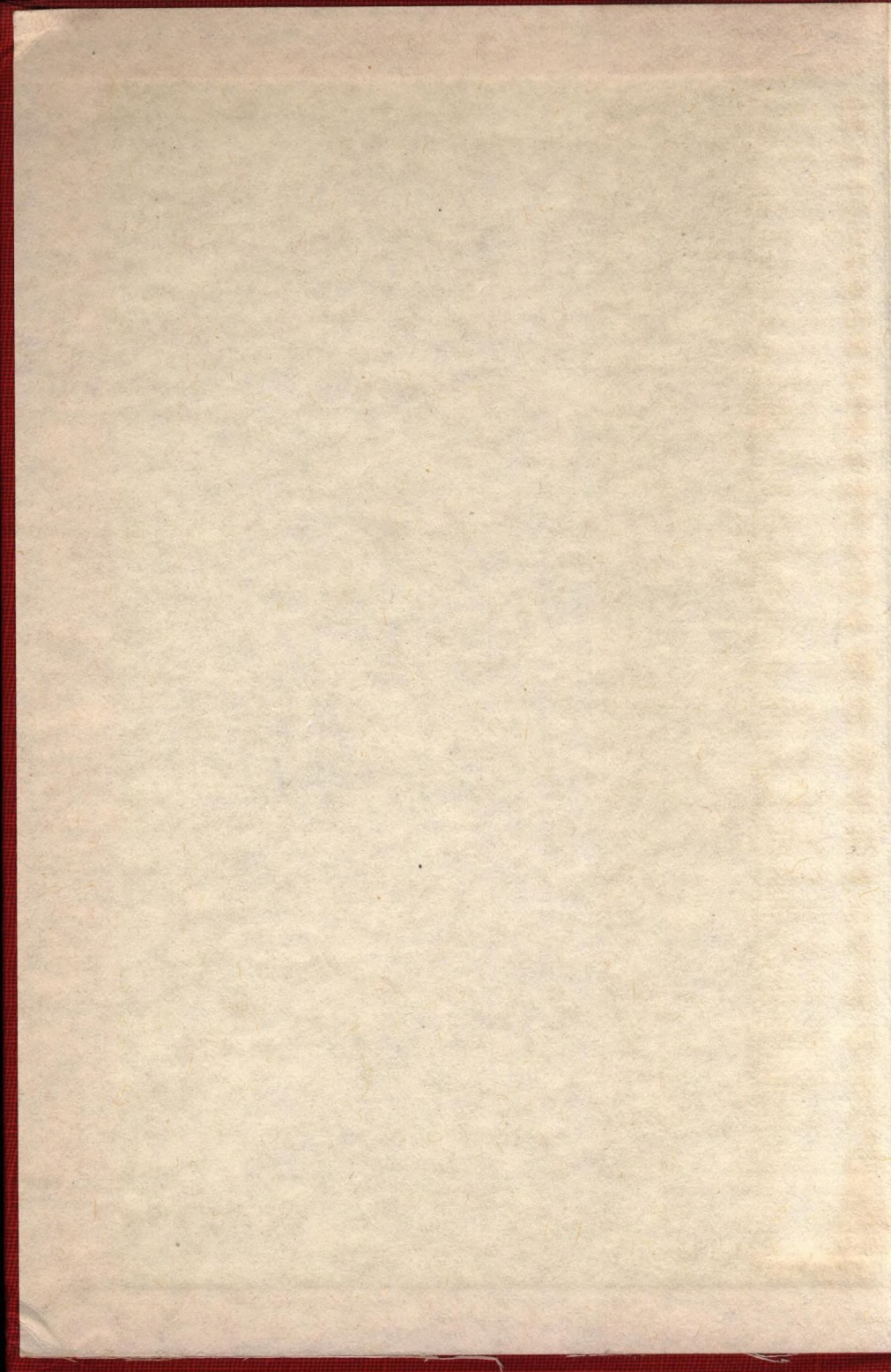


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BLAIR

The Hydrogen Bomb

McKay







THE HYDROGEN BOMB



THE HYDROGEN BOMB

The Men

The Menace .

The Mechanism

**By James R. Shepley
and Clay Blair, Jr.**

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MANUFACTURED IN THE UNITED STATES OF AMERICA

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FOREWORD

A full assessment of the delay in development of the hydrogen bomb and its effect on the survival of the United States as a nation and upon the future of mankind will be impossible for some years to come. These reporters have not attempted to do so here or to ascribe motives to the individuals responsible. They have, however, reported what occurred so that at least the events themselves shall at last be removed from the dark forests of secrecy and speculation and in order that the people of the United States can have some basis for judging how their interests have been served.

An accurate report of the bitter struggle over the development of atomic weapons must, to be understood, necessarily include some technical information. In the field of atomic energy, such a discussion is closely proscribed by the genuine requirements of national security. It is, in part, for this reason that the nation's journalistic mediums have largely overlooked or ignored the weapons struggle. Yet, with the full approval of the Atomic Energy Commission or the Joint Congressional Committee on Atomic Energy, much technical data has previously been published—enough, in fact, to make sense out of the strange story of the weapons conflict once the background of that conflict has been established. These reporters have not discussed technical data that has not been published before or that cannot be directly derived from published material. We could not, in any event, since we had access to no other technical information from any source.

Preparation of this report began months before these re-

porters became aware of the so-called Oppenheimer security case. By the time the report of the Security Board, headed by Dr. Gordon Gray, President of the University of North Carolina, Chairman, was released, they considered themselves well versed on the general subject. In many cases, the Gray Board report and the transcript of the hearings, later released, provided invaluable incident and detail. After reading the report and 992 pages (more than 500,000 words) of testimony, as well as the conclusions of the Atomic Energy Commissioners themselves, they are obliged to say that Dr. Gray and his associates undertook a formidable and disheartening task with magnificent courage and devotion to the public interest.

JAMES R. SHEPLEY
CLAY BLAIR, JR.

PART ONE



Chapter 1

“JOE ONE”

IN LATE AUGUST, 1949, a United States Air Force B-29 bomber rolled down the runway of a Far Eastern base, then climbed gently up into the summer sky. Several minutes later, the big silvery plane leveled off, the pilot switched on automatic controls, and the crew settled back for a monotonous and presumably routine flight.

The plane and its crew were on a special mission for the Air Force, one that was more concerned with the peaceful than the warlike pursuits of man. Part of a large-scale research program, the B-29's mission was to fly a predetermined course and, through the use of special photographic plates that were mounted throughout the plane, measure the penetration of cosmic rays through the earth's atmosphere. Later the information on the plates would be studied in U.S. laboratories by scientists seeking clues to the nature of the universe.

The B-29 was only one of scores of aircraft assigned to the project. Its flight, with the cumbersome photo plates, was by no means the first. As it droned over its prescribed and scientifically plotted course, its plates sopped up the cosmic rays. Finally, to the relief of the bored crew, the mission was over. The B-29 returned to base and landed. The photographic plates were removed. The crew repaired to its quarters.

The plates were taken to a scientific laboratory for developing and packaging. In the darkroom, the airman who developed

the plates was bug-eyed; instead of the usual streaks of light made by the cosmic rays, the plates were saturated. Apparently the B-29 had flown through an intensely "hot" area. Could so much cosmic radiation be possible?

The laboratory's top scientists hastily were summoned. They examined the plates carefully. Quickly they ruled that such a quantity of cosmic-ray penetration was unthinkable. Something else had caused the saturation of the plates. One scientist remarked that such saturation reminded him of the residue from a mushroom cloud, the grim umbrella of an atomic bomb. But, the scientists well knew, the U.S. had not exploded an atomic bomb during 1949.

Then, slowly, the ominous thought took form: Had some other nation—the Soviet Union perhaps—shot an atomic bomb? It seemed inconceivable since the U.S. then enjoyed an atomic monopoly that its scientists and military intelligence alike were confident would continue for at least three more years, and more likely ten. Yet it was a possibility that had to be explored. Quickly, the scientists contacted the United States Air Force headquarters, which had only the year before established an atomic-bomb detection unit, with special planes to go aloft and scoop dust particles from the air. The Air Force moved the unit into emergency action. In hours, other B-29's were retracing the steps of the cosmic-ray search plane in an effort to capture air-borne particles for positive identification.

Later the B-29's returned to base. Their scoops had obtained the samples. After a preliminary review in the field, the samples were rushed to two Atomic Energy Commission laboratories in the United States.

Several days passed before the dust samples could be thoroughly analyzed and the report hurried to Washington. The analysis confirmed the fears of the scientists: A Soviet atomic explosion had taken place. Moreover, the analysis suggested that the Soviets had detonated a plutonium device far advanced technically over the first U.S. explosion at Alamo-

gordo. AEC scientists estimated that "Joe One," as the Soviet explosion was quickly labeled, had exceeded the force of the Hiroshima bomb by a factor of six. The Soviets, it appeared, had skipped over the trials and errors of the early U.S. developmental period.

For the West it was one of the major turning points of history, and like most such events it went unnoticed by mankind in general. In the U.S., the Dodgers and the Cardinals were in a cliff-hanging race for the National League pennant. The Vice-President, somewhat advanced in years and highly regarded, was in what appeared to be an equally close race for the hand of an attractive St. Louis widow named Mrs. Hadley. The biggest news story of the summer, the revolt of the admirals against the B-36 and the doctrine of strategic bombardment, had just about run its course.

If the fiercely radioactive dust cloud, which appeared as a stranger orbiting in the upper air, caught the U.S. public dreaming happily of romance, it caught Washington and the U.S. Government little more alert. The U.S. had only recently set up the detection net that confirmed its existence. Even this had been done only after long delay and disbelief within the Atomic Energy Commission that such measures were necessary.

Almost too late, the U.S. had discovered from its diplomatic encounters in Paris, London, and New York, and from the experience of Czechoslovakia and Greece, that its postwar feeling of comradeship for the Soviet Union had been just a little dewy-eyed. The Soviets, in the form of their round-headed foreign minister Vyacheslav Molotov, turned out to be tough, ruthless men with clear objectives in mind. The objectives were becoming more and more unmistakable: the prosecution of the world-wide Communist revolution that Marx and Lenin had envisioned. The Soviets were prepared to use muscle—as in the Czechoslovakian "Action Committee"—to get what they wanted. But neither the U.S. in general nor Washington in particular had yet come to accept the Soviets

for what they were in terms of scientific knowledge and intellectual resources—the full equals of the U.S.

This dangerously naïve intellectual-superiority complex was particularly strong in the scientific community and consequently in the Atomic Energy Commission, the civilian agency established by Congress after Hiroshima to keep tight control on all atomic affairs in the United States, peaceful and military. The AEC had been fashioned out of the Adam's rib of the Manhattan District of the Army Engineers, which produced the wartime A-bombs.

All of the Manhattan District facilities, such as the Weapons Laboratory near Sante Fe, New Mexico, known as Los Alamos, the Isotope Separation Plants at Oak Ridge, Tennessee, and the plutonium-producing piles at Hanford, Washington, had become the property of the AEC. The AEC was responsible for procuring the ores of the fissionable heavy metals, uranium and thorium, for converting them into usable concentrations of pure metal, for manufacturing weapons, as well as radioactive isotopes, useful in medicine and industry, and electric power reactors for ship propulsion and generators for electricity. The AEC was also charged with responsibility for keeping the United States ahead of the world in atomic development. To do so, it had to pursue its own research as well as attempt to keep abreast of progress throughout the world, particularly in the Soviet Union.

In September, 1949, the AEC was headed by Chairman David Eli Lilienthal, whose name was synonymous in the minds of Republican Senators in Washington, with Franklin Roosevelt's New Deal and big government. Lilienthal had been born in the little town of Morton, Illinois, the son of Jewish immigrants from a village near the old Austro-Hungarian city of Pressburg. He had studied at Depauw University and Harvard and had got his first job with a Chicago law firm headed by Donald Richberg, then counsel for the railway brotherhoods, later for the Standard Oil Company.

In 1933, when Lilienthal was only thirty-three, F.D.R. had

chosen him for the Tennessee Valley Authority, of which, after a long battle with its first chairman, Arthur Morgan, he became head in 1938.

By the time of "Joe One," Lilienthal was covered with the political scar tissue that marks the long-time veteran of Washington power struggles. When he was appointed by President Harry Truman to head the new Atomic Energy Commission, an old foe, Tennessee's late patronage-hungry Senator Kenneth McKellar, had attempted to block his confirmation. The subsequent hearings developed into one of the twentieth century's first great Senatorial "brain-washings." Later, the Joint Congressional Atomic Energy Committee launched a Senatorial investigation into the "incredible mismanagement" of the AEC. Wounded and weary, Lilienthal nevertheless clung to his New Deal faith and generally regarded atomic weapons with a sense of revulsion. Lilienthal conceived his role in the AEC chairmanship, understandably under the circumstances, as a dedication to the advancement of the benign uses of atomic energy.

There were four other members of the AEC, three of whom customarily stood with Lilienthal in issues that came before the Commission. They were Sumner T. Pike, a down-Easter, born in Lubec, Maine, who had been a New York business executive in the twenties and thirties and had come to Washington to begin a government career as an adviser to Harry Hopkins, then Secretary of Commerce. The scientific member of the Commission, just appointed the previous May, was the one-time head of Princeton's Physics Department, Henry de Wolf Smyth. Smyth was the Manhattan District scientist who had authored the first official War Department publication on the atomic bomb, entitled "Atomic Energy for Military Purposes" but far better known as the "Smyth Report."

Another newly appointed member of the Commission was a relatively obscure government lawyer named Gordon Dean. Dean had been a law partner of the man who at the time of "Joe One" headed the powerful Joint Congressional Com-

mittee on Atomic Energy, Connecticut's freshman Democratic Senator Brien McMahon, and owed his appointment to this association. Dean had been a Justice Department lawyer under Attorneys General Homer Cummings and Robert H. Jackson. He had once acted as Public Relations Director for the Justice Department and had more than the average lawyer's knowledge of how to handle two of the most touchy groups in Washington—the Congress and the Press.

The final member of the five-man AEC was its great dissenter, Lewis Lichtenstein Strauss (pronounced "Straws"), a New York banker, who, as a Naval Reserve officer, had reached the rank of rear admiral during World War II. Strauss was the Republican member of the AEC, had been appointed to the Commission, upon its creation, by Harry Truman. He had made his mark on Harry Truman and Democratic Washington by his wartime service in the Navy, not because of his political acceptability or lack of it.

A quiet, courtly Virginian of deep religious faith, Lewis Strauss was often mistakenly thought to have been born with, in his mouth, the silver spoon of one of the wealthy New York City families of similar name. He came from much humbler beginnings. His father was a Richmond, Virginia, shoe wholesaler when Lewis Strauss was graduated from John Marshall High School and took a job as a drummer on the road. By day he displayed his fourteen trays of shoes. By night he read the Latin classics, studied law and physics.

One winter's day in 1917, Strauss boarded the Richmond, Fredericksburg and Potomac Railroad for Washington to seek out Herbert Hoover, who had established the headquarters of his Belgian Relief Commission in the Willard Hotel. He walked in unknown and unintroduced and was almost sent on his way by Hoover's secretary when the great engineer himself appeared on the scene.

"When can you go to work?" Hoover asked.

"Right away," Strauss replied.

"Take off your coat," Hoover ordered.

By 1919 Hoover was Director General of the Allied Supreme Council, and Lewis Strauss was his personal secretary. The job took the Richmond shoe drummer into the environment of grand diplomacy and European intrigue. In it he struck up a lifetime friendship with a young lawyer who worked for Hoover, named Robert Alphonso Taft, and caught the eye of a friend of Hoover's named Mortimer Schiff, millionaire member of the Wall Street investment firm of Kuhn Loeb and Co. After World War I, Strauss went to work for Kuhn Loeb, where he piloted the financing of such huge industrial projects as Inland Steel and U.S. Rubber and such inventions as Kodachrome film and Polaroid glass. He married Alice Hanauer, daughter of a Kuhn Loeb partner, and wound up occupying the office of the late Otto Kahn, long-time head of the firm and famed Wall Street financier.

At the outbreak of World War II, Strauss headed back to Washington as a Reserve lieutenant commander. He landed a berth in the Navy's Bureau of Ordnance, but his business experience and his abilities were far above his rank and billet. Fellow Wall Streeter James Forrestal, as Secretary of the Navy, soon installed Strauss as his special assistant. Strauss annoyed regular Navy brass by his quiet wit and his light-hearted breaches of Navy procedures, but he came out of the war a rear admiral with a Distinguished Service Medal and Legion of Merit and was made the Navy's representative on the important new "Interdepartmental Committee on Atomic Energy." This became Strauss's direct route to the AEC.

His Wall Street background and archly conservative naval associations kept his eyes dry about Soviet Communism from the start. Like his good friend, Jim Forrestal, he was one of the first to sound the alarm in official Washington circles that Stalin was no simple warmhearted father of his people. Strauss's conservatism and his suspicions of Soviet intentions put him almost constantly in dissent from his fellow members of the AEC. It was Strauss alone in the AEC who long de-

manded and finally saw established a detection net for the discovery of just such an event as "Joe One."

The Atomic Energy Commission had the immediate responsibility for keeping the U.S. ahead in atomic armaments at the time the news of "Joe One" broke over Washington, but parallel responsibility for our military security lay with the newly created Department of Defense at the Pentagon. The Pentagon was generally at odds with the AEC, since the military historically tends to lean to conservatism and look with suspicion toward nations that demonstrate the capability, let alone the intent, to bring armed action against our nation or its allies. Against the will of the AEC, the Pentagon forced a foot into the door of the AEC through an atomic liaison committee. The military was for the most part uneasy about the development of weapons under what it regarded as the soft, unrealistic management of the AEC and would have preferred to control weapons development, and the weapons, in the armed forces. It was precluded by law from the former and from the latter by Harry Truman's order giving custody of atomic weapons to the AEC.

The Pentagon was a natural ally of Lewis Strauss, the AEC dissenter, but at the time of "Joe One" this alliance was for all practical purposes in a state of suspension. For the Pentagon was preoccupied in an unprecedented economy drive and had little time for the bureaucratic guerrilla wars that make Washington interesting and, to the outsider, baffling.

Harry Truman had just been elected President (in 1948) to the great surprise of all the experts and of his Republican opponent, Governor Thomas E. Dewey of New York. Truman had based his campaign on an attack against the Republican 80th Congress and its attempts to trim some of the parts of the New and Fair deals. He believed that the people wanted more government activity in the fields of social security, housing, farm parity. One of the principal obstacles to this kind of progress, he discovered when he added up the Federal budget in 1949, was the still swollen military budget.

Truman had appointed his campaign money raiser, Louis Johnson, to be Secretary of National Defense, succeeding Forrestal, with instructions to cut military expenditures. Johnson was a shrewd, ambitious, soft-spoken lawyer from West Virginia who had got a taste of the pleasures of public life as an Assistant Secretary of War under F.D.R. and as Mr. Roosevelt's personal envoy to India during the war. One of the American Legion's most successful kingmakers, Johnson had long cherished the ambition to head the nation's military forces. He had guessed right in 1948 and had stood firmly with the extremely thin ranks of Democrats who thought Harry Truman had a chance and were willing to help him. His appointment as Secretary of National Defense fulfilled an aspiration of very long standing and Louis Johnson had no intention of jeopardizing his position. When Truman ordered, "Cut," he set out to cut "fat not muscle" as he put it, but cut. "Joe One" found Louis Johnson with his knife honed to a razoredge and poised in mid-air.

Chapter 2

WHAT ABOUT THE SUPER?

THE SECRET of the strange cloud that had appeared in the upper air was rushed through enciphered military communications to the Washington headquarters of Chairman William Webster of the Defense Department's atomic liaison committee. Webster's hands trembled as he read the message marked "Top Secret." He asked the British if their own detection net confirmed the news. It did. Then he hurried the word to his superior, Secretary of Defense Johnson, who received it with unconcealed skepticism.

"How can we be certain that the explosion was a Russian bomb?" Johnson demanded. "It could have been a laboratory accident." Had not the scientists left open a 5 per cent area of doubt, Johnson asked? *

It seemed incredible to Louis Johnson that the Soviet Union—the "backward boy" of science and technology—could have mastered the secret of the atom, built the enormous industrial facilities needed to produce fissionable material, and fashioned an atomic weapon in so short a time.

* The original analysis was not complete. It stated that there was a slight chance, 1 in 20, that the explosion was not a bomb. By September 23, U.S. scientists positively confirmed that "Joe One" was a bomb. British scientists independently reached the same conclusion.

Only four years had elapsed since the U.S. had detonated its own, first, prized atomic bomb at Alamogordo. Major General Leslie R. Groves, who supervised the wartime Manhattan District and who in 1945 probably knew more about the enormous problems of producing an atomic bomb than any man, had advised the U.S. Government that the Soviets would need fifteen or twenty years to build an atomic bomb.

General Groves's reassuring prediction, which formed the basis of postwar U.S. foreign and military policy, had been bolstered by the opinion of prominent scientists, including Dr. Vannevar Bush, who directed the important Office of Scientific Research and Development during World War II. Bush predicted in 1946 that if the Russians relied entirely on their own resources, twenty years would be required for the Soviets to produce an atomic bomb. At the time of "Joe One," Bush's book *Modern Arms and Free Men* was on the presses with a prediction of ten years. The presses had to be stopped, and the embarrassing prediction cut out of the type.

The wrong guesses of Bush and Groves, made with the full knowledge that the Soviets employed perfectly capable physicists such as Peter Kapitza, Fersman, Frenkel, Joffe, and others, had been substantiated within official governmental circles by equally wrong guesses of the military intelligence agencies. The Navy figured 1965. The Army guessed 1960. The Air Force, in what was considered a biased and "alarmist" estimate had put the date at 1952.

There was another even more compelling reason for Johnson's skepticism of the evidence picked up by the detection net: It placed him and his entire policy as Secretary of Defense squarely in error. Confident of a strong, safe, U.S. monopoly in atomic weapons for many years to come, Johnson, shortly after taking office, had aimed his economy drive at cutting costly U.S. standing military forces to peacetime garrisons. In his eagerness to trim "fat from muscle" Johnson had forced drastic new reductions in U.S. armed forces levels, already

decimated by the helter-skelter liquidation of U.S. power after V-J Day.

The Marine Corps had been reduced to a police force. More cuts were in store. The Navy's pride, the expensive super-carrier *United States*, had been canceled. The Air Force, charged with the nation's number-one power role, strategic atomic retaliation, had been chopped to forty-eight wings in the face of professional and even Congressional demands for seventy.

Exuding confidence, Johnson had cut the total U.S. defense budget to thirteen billion dollars, declaring that if the Russians struck at four, he would strike back at five. Now the shadow of "Joe One" fell across Johnson's hatchet.

If the Secretary chose to believe "Joe One" was what it was, a Russian atomic bomb, then he had to face the fact that the U.S. atomic monopoly was gone; that the U.S.'s great deterrent atomic force—in one stroke—had been neutralized. If he so believed, then Johnson had no other alternative than to stop his economy program and order an immediate and urgent expansion of the U.S. Air Force and U.S. atomic weapons production, without regard for cost.

Economizer Johnson, like many a defeated military commander, chose to disbelieve the intelligence.

Thus, when word of "Joe One" finally reached the White House, later in the same September afternoon, it was carefully hedged and couched in qualifications invented by the Department of Defense.

Harry Truman heard the secret in the Presidential study—an oval, light-filled office that overlooks the White House Rose Garden.

He listened to the dramatic news in silence. At the conclusion of the briefing, he sighed deeply and, unlike his Secretary of Defense, accepted the full meaning of the news. Harry Truman saw immediately that a momentous event had overtaken his nation.

"That means we have no time left," he said solemnly, to no one in particular.

Harry Truman was not distinguished for his eloquence. If he had been, he could not have characterized the situation into which the United States had slipped in September, 1949, more aptly. Truman understood that time was running against the U.S., but he was unable at the moment to define a course of action for turning the trend the other way.

In Harry Truman's lifetime the U.S. had fought in two great wars. The first was described as a war to make the world "safe" for democracy. Its failure to do so plunged the entire nation deep into disillusion. And by the time of the second world war, the people had developed such a distrust of rhetoric that they rejected Franklin Roosevelt's attempt to characterize it as a war for "survival."

Actually the U.S. had, in colder geopolitical terms, entered both world wars to preserve a balance of power in favor of its *friends of the moment*. Both essentially were wars of survival, and nothing more could rationally be expected of either war, or indeed, of any war. The first produced a result of two decades' duration. The second, suggesting perhaps something of a trend in nationalistic encounters, created a new power struggle as great as, if not greater than, the one it settled. Germany, Italy, and Japan were knocked out of the power scales only to make room for the Soviet Union.

Once more the U.S. and its leaders had not heeded history's obvious lesson. The post World War II demobilization was almost hysterical. Certainly it was without responsibility. On V-J Day, the U.S. had the greatest concentration of air and sea power in the history of warfare and land armies qualitatively inferior to none. A few months later it did not rate as a first-class military power in terms of these conventional arms.

The Soviets never demobilized. In almost no time, the Soviet Union became the only great land power on earth. Her submarine force grew steadily to a force of 270 undersea

raiders, five times more than the 57 Germany put to sea at the beginning of World War II when she almost won the battle of the Atlantic.

The Soviets gave top priority to aircraft production. Since the jet was in terms of mobility what the atomic bomb was in terms of fire power, she soon exceeded the U.S. both in numbers and in quality in most types of air power. By 1949, her production of jet planes had totaled 10,000 as compared with 4,600 in the U.S. The Red Air Force had 18,900 aircraft in combat units. The U.S. Air Force and Navy together had 9,000 planes—a bare handful of jets—in combat squadrons.

All of this massive conventional military power was held in balance by a single factor—the U.S. atomic monopoly. It was recognized by all thoughtful national leaders that the Soviets could overrun western Europe and the Middle East and probably North Africa at will. She did not, only because she feared atomic annihilation at the hands of the U.S. Strategic Air Force.* Winston Churchill was the first of the world's statesmen to recognize this precarious balance of world power when he said on October 18, 1948, to a Tory party conference in Wales:

It is my belief—and I say it with deep sorrow—that . . . the only sure foundation of peace and of the prevention of actual war rests upon strength. If it were not for the stocks of atomic bombs now in the trusteeship of the United States, there would be no means of stopping the subjugation of Western Europe. . . . If the United States were to consent, in reliance upon any paper agreement, to destroy the stocks of atomic bombs . . . they would be guilty of murdering human freedom. . . . I hope you will give full consideration to my words. I have not always been wrong. . . .

This then was the terrible significance that suddenly overwhelmed Harry Truman when he heard the news of the

* The fact of the atomic monopoly alone was the deterrent. Actually, it was largely a paper monopoly. Much of the time, the U.S. atomic stockpile was not a stockpile at all, but a handful of low-power bombs.

Soviet atomic explosion in his White House office on that September day of 1949.

The news of "Joe One" was taken from Truman's oval study to the National Security Council, heart of the U.S. Government's high-level, policy-making machinery. The next day a meeting was held in a high-ceilinged room in the old War-Navy-State Building across West Executive Avenue from the White House. Ten men were present, the President, Secretaries of State, Defense, the Director of the Central Intelligence Agency, and other top advisers.

The National Security Council is a strategic super cabinet created by the National Defense law. The NSC is composed permanently of the President and the Secretaries of State and Defense. The President is free to designate additional members at will. It is charged by the Defense Act with making the broad over-all decisions that determine the security of the United States: How large an Air Force, Army, and Navy? Shall U.S. armed forces be sent to Korea or Indo-China? Shall the U.S. build more or less atomic bombs? Shall it attempt to defend Western Europe or build an isolated fortress in the Western Hemisphere?

In effect, the NSC can only advise the President, the Commander in Chief. The hard decisions that determine the fate of the nation in the end must be made by one man, the President of the United States.

In the first NSC meeting following the news of "Joe One," Soviet behavior since World War II was re-examined. Notice was taken of futile U.S. attempts to "coexist" with the Soviet, including efforts through the United Nations toward international control of atomic energy and general demobilization. Then followed recital of the evidence of "Joe One." The explosion meant that in all probability Russia, in only four years, had constructed a complex industrial system capable of producing fissionable material. The alternatives were (1) that the explosion was a laboratory accident, as Johnson believed, or (2) that the Soviets had actually stolen enough U.S.-made

fissionable material successfully to explode a bomb, a conclusion unsupportable by the facts.

No one spoke for a moment but the thought was in every mind. The President spoke it first: "Where do we go from here?"

Secretary of State Dean Acheson made the first concrete proposal. He declared that the Defense Department's economy program was unrealistic and must be reversed. Acheson said the U.S. must rearm speedily and forget such aims as balancing the national budget. We must influence our allies to do the same, Acheson said. Echoing Truman's warning of the day before, he added: "This is a great crisis. We have no time to lose."

In the end, no one disagreed. Even Louis Johnson, after a little persuading, admitted that Acheson's argument had logic, that in the light of the evidence it would be suicide for the U.S. to continue to *assume that the Soviets did not have the bomb*.^{*} The U.S. henceforth must proceed with its national planning based on the assumption that the Soviets had an increasing stockpile of atomic weapons.

Later, in a famous paper numbered NSC 68, the Security Council laid down the U.S. strategic reply to the Soviet explosion and increasing U.S.-Russian tension. The decision was made to put the U.S. in "situations of strength" throughout the world to meet the growing threat of Soviet encroachment. However, Johnson's economy plan had cut deeply: Not until

^{*} Johnson was never really convinced that the Soviets actually had an atomic bomb. Truman himself later backslid toward the same view. In January, 1953, long after several atomic explosions in Russia had been definitely established, ex-President Truman in Missouri expressed doubt that the Soviets possessed the bomb. From his West Virginia home, the ex-Secretary of Defense sided with the ex-President, and at that late date, remained skeptical. Truman's extraordinary persistence on this point finally prompted the chairman and the two ranking members of the Joint Congressional Committee on Atomic Energy to issue on January 27, 1953, what they hoped would be a final definitive statement that the Soviet explosion had been a bomb. "Probably never in history," they concluded, "has such clear-cut evidence been examined so exhaustively so often to arrive at the same simple and unavoidable conclusion."

Korea—eight months later—was the U.S. impelled into sufficient mobilization to move toward a “situation of strength.”

In its September meetings, the National Security Council was unanimous in its view of the significance of the Soviet explosion but could not agree on what to do with the Russian secret. Should it be hidden from the world? Or should the American people be told? What if the Soviets broke the news first, in an effort to use it as a weapon of fear to paralyze the will of Europe and the free world?

Secretary of State Acheson argued for announcing the news. Secretary of Defense Louis Johnson opposed. He insisted that the announcement would create national hysteria, and recalled the panic caused by Orson Welles's fictitious radio account of a Martian attack on the U.S. to bolster his point.

The questions were resolved in a few days, when the U.S. learned that Soviet Representative on the U.N. Security Council, Andrei Gromyko, had scheduled a major speech. Fearing Gromyko would break the news, Truman decided to take the initiative—make the announcement casually and minimize alarm.

Two weeks from the day the radioactive dust cloud drifted across the western Pacific, a White House statement was read privately in rehearsal before the Cabinet.

I believe the American people, to the fullest extent consistent with national security, are entitled to be informed of developments in the field of atomic energy. . . . We have evidence that within recent weeks, an atomic explosion occurred in the USSR. Ever since atomic energy was first released by man, the eventual development of this new force by other nations was to be expected. . . . This recent development emphasizes once again . . . the necessity for that truly effective and enforcible international control of atomic energy which this government and the large majority of the members of the U.N. support.

As Truman read the announcement in his flat Missouri twang, a sudden storm broke over Washington. Thunder

rumbled; lightning flashed; rain lashed the White House windows. Then, just as abruptly, the storm was gone. The President remarked that the sudden storm might be an omen.

His announcement was distributed to reporters at the White House on September 23. As the news tickers began to bulletin the statement, the recent blast on a Siberian plain became a shot that echoed around the world.

There was no panic. The American people largely took the news in stride. In Congress, there was little discussion. Most statements were designed to reassure and took the line that the U.S. had expected this all along. In Europe there was a definite increase in neutralism, but certainly no widespread flight to the bomb shelters. Many Britons, visualizing themselves caught in between two atomic giants who might nervously begin throwing A-bombs at any moment, pressed anew for outlawing this weapon.

The one reaction that altered history and truly set the stage to keep free men abreast of their fate did not occur in public. It came a few days after the President's announcement. Lewis Strauss, the quiet, conservative, Republican member of the Atomic Energy Commission who had consistently been in the forefront of the fight for bigger and better weapons, sat down at his desk to write a brief memorandum.

In his deep concern at the news of "Joe One" he had searched his mind for an answer. Long since forgotten and almost lost in the files of the AEC was a proposal made far back in 1945 to build a super atomic weapon, a bomb that might be a thousand times bigger than "Joe One."

Strauss had called for the dusty file and reread it with a new curiosity. If such a bomb could be built, Strauss decided, the news of the Soviet explosion made it imperative that the U.S. do so. Since the key to the superbomb was an atomic bomb of the kind the Soviets had exploded, it was necessary to assume that the Soviets themselves might already be started on this next horrendous step.

Strauss's memo made these points:

- 1) When the Soviets exploded the atomic bomb, the U.S. forever lost its monopoly in the atomic weapons field.
- 2) At the moment that the Soviet had as many atomic bombs as it needed, the Kremlin would strike. It mattered not whether the U.S. had 1,000 or 100,000 more bombs than the enemy.
- 3) The U.S. must find a way to hold back a third world war until the Soviet hunger for conquest was weakened by internal strife.
- 4) Our only hope was to create a new and greater deterrent to Soviet aggression, a weapon many times more powerful than the A-bomb. Hence, the AEC must turn its vast energies immediately to the manufacture of a hydrogen bomb.

In the words of the physicists, Strauss wrote, the U.S. must make a "quantum jump" in its atomic planning. In closing, Strauss requested that the General Advisory Committee be called to consider how best to proceed with the H-bomb program.

The memo was addressed to his AEC colleagues. Chairman Lilienthal was not impressed. Lilienthal's view of the significance of "Joe One" was expressed in a speech that he made several days later:

The news means that we should intensify our efforts in developing the peaceful and benign applications of our new knowledge. . . .

Most important, the news from Russia means that we should seek to develop to the utmost our greatest weapon of all, that working faith in the spirit of men that we call democracy. . . .

Lilienthal opposed the superbomb then. It was a view from which he never departed while head of the AEC. At the time he received Strauss's memo, he was supported by the other three members of the Commission. It became quickly and painfully clear to Lewis Strauss that if the U.S. was to give thoughtful consideration to building a superbomb, the issue

would have to be taken out of the hands of the Atomic Energy Commission.

The logical place for him to appeal was Congress. In 1946, the Congress, in an unprecedented action, had set up a special watchdog committee composed of members of both the House and Senate to keep a close eye on the momentous new questions involving atomic energy. The chairman of this committee was the comparatively new Senator from Connecticut, Brien McMahon. Strauss sent a copy of his October 5 memo to Chairman McMahon.

McMahon reacted as Strauss had hoped. He immediately called representatives of the AEC before his committee and demanded: "What about the super?"

McMahon had already come to think of himself as custodian of the nation's atomic future. Atomic energy had become a dedicated cause to the Senator from Connecticut. McMahon's vision was clearer than that of other Senators, with the possible exception of the ranking Republican member of his Joint Committee, Iowa's Bourke B. Hickenlooper, and the meaning of Hiroshima broke over him in a mighty swell. As a raw freshman Senator, he had grabbed the atomic ball by introducing the legislation that eventually became the Truman Administration's program for civilian control of all U.S. atomic activities.

It was one of the most successful political gimmicks of the postwar years. From this start he had laid claim to the Chairmanship of the special Joint Committee of the House and Senate. Thus, the power of the atom even had its effect in that most exclusive club in the world—the U.S. Senate. Ordinarily it takes years to advance from the ranks of Senate freshman to the lofty heights of leadership. Almost overnight McMahon—through the proper application of atomic energy—had become one of the senior members of the Senate.

McMahon not only had clearer vision than ordinary men. He was highly emotional and deeply religious. His Irish Catholic temperament impelled him to constant attempts to

harness atomic power for the good of mankind, many of them highly impractical. It also gave him a deep-seated fear of godless Soviet Communism. At one moment McMahon proposed that the U.S. embark on a fifty-billion-dollar program to help the world find atomic peace and the next suggested preventive war if the Soviets did not show their good faith by joining in immediately.

McMahon feared that man had opened a Pandora's box when he pried open the atomic nucleus. He hoped to find the way to make the results benign, but he was not at all sanguine about it. Accordingly, he had used the great power and influence of the Joint Congressional Committee to advance the weapons program wherever possible. McMahon controlled the legislation under which the AEC operated.

Having just heard that the Soviets had penetrated into the realm of nuclear energy, McMahon presumably expected to be told that all possible progress was being made to keep the United States on top of the new weapons in which true military power must now be measured. Instead he was told by representatives of the AEC that the hydrogen bomb was regarded as a "long-range" project, that in fact little or nothing had been done about it in the AEC laboratories in the four years since the end of World War II.

The replies of the AEC representatives shocked the emotional Senator from Connecticut.

"How do you know that the Russians did not decide from the beginning to shoot for a *hydrogen* bomb?" he shouted at the AEC representatives. "How do you know that the Soviets, now that they have the A-bomb trigger, will not fire off an H-bomb next month?"

The problems posed by the super, the AEC spokesman replied, were immense.

McMahon was not easily to be put off: "Can you imagine the consequences of the Soviets' obtaining a superbomb before we get one? Suppose from now on we start thinking of the H-bomb as a short-range project? In fact, why don't we push

ahead with our own H-bomb program right now—without delaying another day?”

As McMahon was to learn in bitter months ahead, it was by no means as simple as that. There ensued from this briefing of the Joint Congressional Committee a struggle over the question of building a hydrogen bomb in the U.S. that actually did not come to an end until long after the U.S. was again engaged in a shooting war, in Korea. The debate ended only when there could be no further doubt that the Kremlin intended to pursue the Communist revolution around the world and was prepared to resort to force to achieve its goals.

Before the struggle ended, it set Democrat against Democrat, Republican against Republican, and reached into the Pentagon to influence almost every question of military strategy that arose. It evoked angry discussions inside the Joint Committee, and some Democratic members even talked of bringing impeachment proceedings against the President of the United States, Harry Truman, if he failed to give the go-ahead signal on the super. It created bitterness in the political and scientific communities that would rankle for years.

Much of the struggle—incredible in retrospect—seemed to flow out of the guilt felt by some of the key atomic scientists at having created the atomic weapon in the first place. It was abetted by uncritical acceptance by the people of the theory that because a man might solve a mathematical formula containing twenty-seven unknowns, he is especially equipped as a statesman to determine the affairs of the nation. The scientists retained by the Atomic Energy Commission to advise the Commissioners and the President on technical matters ranged far afield to offer counsel on politics, statecraft, military strategy, ethics, and morality and came within an ace of making their recommendations in these areas stick.

Ironically, moreover, in the very area where their competence would have had to be accepted without question, a great many of them were dead wrong. They said the hydrogen bomb could not be made, or that if it could be made, it would

be done at such a cost in U.S. atomic resources as to be harmful in the long run. This advice turned out to be erroneous on both counts. Nothing in the unexplored area of theoretical science can be predicted with the dogmatic certainty with which many atomic scientists discussed the thermonuclear weapon. They all knew this very well at the time but were carried away by their own predilections.

The debate eventually turned out well for the United States of America—though years late. It might have just as easily turned out the other way. If it had, the consequences could have been enormous. A later President of the United States gave one opinion.

"If the Soviets had beaten us to the hydrogen bomb," Dwight D. Eisenhower told a White House visitor in the spring of 1954, after the U.S. had finally exploded a droppable H-bomb, "Soviet power would today be on the march in every quarter of the globe."

Chapter 3

THE INFLUENTIAL SCIENTIST

THE U.S. GOVERNMENT—especially the AEC, Defense Department, Air Force, White House, and Joint Atomic Committee—with its secret inner circles, complex agency relationships, boards, and committees, formed the stage on which the great struggle over the hydrogen bomb was played. But reduced to its barest essentials, the struggle amounted to a personal duel between two extraordinary men, theoretical physicists J. Robert Oppenheimer and Edward Teller.

Both Oppenheimer and Teller are singular products of the twentieth century's still unresolved effort to cope with the impact of the scientific-industrial revolution on morality and the structure of society. Both are sons of upper-middle-class families that raised them in an environment of economic and intellectual security. Both were born to the same religious faith, and both are intensely moral, if not religious men. Both are intellectual snobs.

Here the similarities between Robert Oppenheimer and Edward Teller end, and the differences that produced the great H-bomb struggle begin. Oppenheimer was brought up in an environment almost literally secure from political misfortune. Early in life he flirted with and became fascinated

by Communism. He contributed his name and his money to Communist causes. His brother, a close friend, became a Communist, and then his brother's wife. Oppenheimer fell in love with one Communist, married another. When he was called to work on the atomic bomb in World War II, he insisted that Communists be allowed to come with him. Even as late as December, 1953, Oppenheimer considered that a onetime Communist fellow-traveler, Haakon Chevalier, who he had said in 1943 had asked him to pass atomic bomb secrets for the benefit of the Soviets, was still his friend.

If Oppenheimer's appraisal of the relationship between politics and morality led him to one set of conclusions, and one course of action, Teller's led him into exactly the opposite. Teller was the son of an unhappy land, Hungary, cursed by geography to lie across one of the principal highways of conflict between East and West. Russia was its traditional enemy. His own lifetime was shaped by the rise of two of the greatest tyrants of history—Adolph Hitler and Joseph Stalin. While Oppenheimer from a distance in the U.S. felt fury at the plight of his fellow Jews under Hitler (and according to his own testimony, went to work on the A-bomb primarily to destroy Hitler and Nazism),* Teller himself in Germany suffered Hitler's treatment firsthand.

Edward Teller had as much reason as any man and more reason than most to have dedicated himself exclusively to the destruction of Nazism. Had he not fled in time, he might have been one of Hitler's victims in the ovens at Dachau. Through this experience, Teller developed a special political talent, rare among scientists, that enabled him to see the Soviet tyrant with the same clarity with which he had perceived the Nazi tyrant. Unlike Oppenheimer, almost from the beginning, Edward Teller became a professed and uncompromising anti-Communist.

While Oppenheimer was, with difficulty, severing many of

* Though, again by his own testimony, he continued to contribute to Communist causes even after the Hitler-Stalin pact.

his Communist relationships after the end of World War II, Edward Teller was trying to warn the West against the men in the Politburo. Wrote Teller in 1947:

The men of the Kremlin showed by their actions that in the world to come, military power will be of the greatest importance. It is the duty of those of us who made the first atomic bombs to find out all the dangers and all the terrors of our discovery. We have eaten of the tree of knowledge and as scientists, we must have faith—perhaps the temerity—to believe that knowledge in the end will be turned into blessing. . . . The development of pure and applied science must not be stopped. . . . The dignity of man and the freedom of science, which is the basis of our life and our work, can be maintained only under a democratic government. . . . “The world cannot remain half slave and half free” must be our guiding principle, regardless of political expediency or of practical difficulties. . . .

Well established by the press as the “Father of the A-bomb,”* Dr. Oppenheimer at the time of “Joe One” had accumulated great prestige and stature among his fellow scientists, some of whom still lingered in military work. He was director of the Princeton Institute for Advanced Study (where Dr. Albert Einstein maintains his headquarters), and President of the American Physical Society. Edward Teller was unknown outside of the community of physicists.

Oppenheimer’s influence in Washington, where he was top adviser on atomic energy matters to the President, the Chairman of the AEC, the Secretary of Defense, and other governmental agencies, was enormous. No scientist in the history of the United States was ever in a more powerful political position or a position to influence more directly governmental

* Actually the technical contributions at wartime Los Alamos were made by: Von Neumann, Segrain, Konopinski, Bethe, Bretscher (a Swiss-born member of the British mission), Christie, and many others. If anyone deserved the title “Father of the A-bomb,” it was Italian-born physicist Enrico Fermi, who constructed the world’s first atomic pile and contributed the key ideas for the atomic bomb.

policy on a high level. No scientist could have had less political influence than Edward Teller.

For a man who once claimed political naïveté, Oppenheimer demonstrated a remarkable talent for getting himself involved in fifty or more political jobs. Here are a few of his postwar activities in the Federal government in Washington: Chairman of the AEC General Advisory Committee; member of the Defense Department Research and Development Board Committee on Atomic Energy; member of the President's Scientific Advisory Board; consultant to the U.S. United Nations delegation; consultant to the Central Intelligence Agency; consultant to the Department of State; consultant to the National Security Council; member, National Science Foundation; consultant to the Joint Congressional Committee on Atomic Energy. In addition, he was Chairman of the Board of Sponsors of the *Bulletin of Atomic Scientists*, the forum where the physicists argued their views.

Of all his jobs the one far greatest in importance was the Chairmanship of the Atomic Energy Commission's General Advisory Committee. The Committee was established by the same law that created the AEC itself. It was designed to give the AEC Commissioners formal access to the nation's top scientific brains in their efforts to keep the United States abreast of all possible atomic developments.

Because of the general admiration for scientists, inspired by their wartime success in unlocking the atomic nucleus, the General Advisory Committee actually acquired far more influence in Washington than the Congress had contemplated. Soon the scientists were offering—and indeed being solicited for—their opinions on every conceivable area of human activity. The politicians in many cases yielded to the scientists on political affairs; the generals deferred on military affairs; the administrators bowed on administrative affairs; and the strategists stood aside on strategic affairs.

This was generally healthy and might be described as “pro-intellectualism,” but like most fads it went too far. Oppen-

heimer himself described the situation later with uncanny embarrassment: "I haven't got all the examples, and I know many times we bowed out and did not answer the questions which were not technical and scientific. Often we were seduced into answering them."

In addition to his positions of influence, Oppenheimer possessed a rare personality, a captivating, dynamic manner, and a flair for dramatics. He was known as a man who could easily win people over to his side; indeed, few scientists or statesmen had the courage to oppose him in debate. As one famous physicist described him: "He is the master of applied psychology." David Lilienthal once said: "He is the only authentic genius I know." Secretary of State Dean Acheson said that the two greatest minds he had encountered were Lord Keynes and Robert Oppenheimer.

Oppenheimer's father was a German-Jewish immigrant who came to the U.S. at the age of seventeen and made a very considerable success as a Manhattan textile importer. The Oppenheims had a country house at Islip, New York, a nine-room apartment on Riverside Drive. His mother—a Baltimorean and an artist (the Oppenheims possessed three Van Gogh originals)—made it a rule in the Oppenheimer household to say nothing rude, harsh, or improper.

"My life as a child," Oppenheimer once recalled, "did not prepare me in any way for the fact that there are cruel and bitter things."

By the time he graduated from school, Oppenheimer could read Caesar, Virgil, Horace, without a Latin dictionary, had read Plato and Homer in Greek, composed sonnets in French and written papers on polarized light.

Schoolboy Oppenheimer was bored by small talk, sat morose, "as though he weren't getting enough to eat or drink."

His interest in science had been aroused at five years. Visiting his grandfather in Germany, Oppenheimer got a little box of minerals as a gift. Soon a collection of rocks from around the world filled the Oppenheimer hallway.

Augustus Klock, private-school teacher who wore Herbert Hoover collars, introduced Oppenheimer to a laboratory. Julius Oppenheimer had begun to consider his brilliant son a kind of special trust and arranged for Klock to give Robert a special intensive summer course in chemistry.

While Klock brewed strong tea in beakers over a Bunsen burner, Oppenheimer turned out a "bushel of work."

In six weeks, Robert completed a year's course. Klock recalls: "He was so brilliant that no teacher would have been skillful enough to prevent him from getting an education." Here Oppenheimer got his introduction to the atomic theory, "A very exciting experience . . . beautiful, wonderful regularities."

The Oppenheims were able to lavish material goods on their extraordinary son as well. He had a twenty-seven-foot sloop, christened *Trimethy* (after trimethylene chloride, a chemical that he liked the sound of).

Chasing rocks in Europe one summer, he contracted dysentery and had to be shipped home. Father Oppenheimer sent him west for his health, and he got his first look at New Mexico. He liked it.

"Harvard," Oppenheimer has said, "was the most exciting time I have ever had in my life. I really had a chance to learn. I loved it. I almost came alive." Oppenheimer bored through the Widener Library stacks. In his third year he took six courses and attended four more (normal quota: five). He even liked exams and got A's.

Oppenheimer decided that physics was his first interest, but he did not enter into that austere intellectual priesthood, as some did, without exposure to the world of ideas that lay beyond it. At Harvard, the youth who had already met Sophocles, and who was later to be bewildered and surprised by the evil in the world, discovered Dante and pored over French literature.

Once a professor identified a picture as a temple at Segesta, Sicily, built about 400 B.C. Young Oppenheimer quickly set

him straight: "I judge from the capitals on the columns that it was about fifty years earlier."

Oppenheimer wrote poems and stories ("an attempt to make peace with the world"), wore his hair long, liked to debate with high-brow friends.

"My feeling about myself was always one of extreme discontent," he has recalled. "I had very little sensitiveness to human beings, very little humility before the realities of this world."

He graduated (1925) *summa cum laude* in three years. His class yearbook contains a one-line entry on Oppenheimer: "In college three years as an undergraduate."

On his twenty-first birthday, Father Oppenheimer gave him a sizable sum of money. He decided to spend it on more education.

Oppenheimer sailed for England and Cambridge University, where he was a "complete failure in the lab" but a success at theory. "Quantum mechanics had just begun to come into existence. It was a very exciting time in physics. Anyone could just get in there and have fun." At Cambridge, Oppenheimer met some of the leaders in physics: such men as Max Born, Paul Dirac, and Niels Bohr. ("It would be hard to exaggerate how much I venerate Bohr," Oppenheimer says. Edward Teller, who went to Copenhagen to study under Bohr, says the same thing.)

But in spite of the opportunity to learn much, Oppenheimer fell into depression and doubt. He read Dostoevski, Proust, Aquinas, explored the defects in his own character. Walking by the shore in Brittany one Christmastime, "I was on the point of bumping myself off. This was chronic." Later he believed he came out of this period of self-examination "much kinder and more tolerant—able to form satisfactory, sensible attachments."

He accepted Max Born's invitation to Göttingen, where he earned his Ph.D. (at twenty-three) in three weeks. Oppen-

heimer's thesis was a paper on quantum mechanics. A colleague asked physicist James Franck how the oral examination had gone with Oppenheimer. Franck replied: "I got out of there just in time. He was beginning to ask me questions."

Oppenheimer returned from Europe (after further study at the University of Leiden and Technical High School at Zurich) in the spring of 1929.

He had a racking cough. The doctors feared tuberculosis and advised him to go west. Near the spot where he had vacationed once before, Oppenheimer leased a ranch, thirty-five miles from Santa Fe, New Mexico.

It was a corral and a crude ranch house that Oppenheimer called *Perro Caliente* (Hot Dog). Not far to the west was a small New Mexican town called Los Alamos,* populated largely by a fashionable boys' school that later under physicist Robert Oppenheimer became the Manhattan District's top-secret atomic laboratory. Here he rode his horse, Chico, forty miles a day, exploring the Sangre de Cristo Mountains. In the evenings, he drank *Kirschwasser*, and read by the light of an oil lamp. The racking cough soon disappeared.

Robert Oppenheimer presumably had finished his preparation for life and would come down from the mountain a journeyman rather than an apprentice. Actually he did not, by his own subsequent and most extraordinary account. He still had to learn of the conflict and interplay of the aspirations of large groups of people that we know as politics. This political awakening of Robert Oppenheimer was described years later—in March, 1954—when Oppenheimer replied to charges defending his loyalty and integrity in a thirty-five-page letter to the Atomic Energy Commission.

I had had many invitations of University positions, one or two in Europe, and perhaps ten in the United States [Oppenheimer wrote]. I accepted concurrent appointments as Assistant Professor at the California Institute of Technology in Pasadena and at

* Los Alamos means literally "The Cottonwoods," the trees that are found in abundance in the area.

the University of California in Berkeley. For the coming twelve years I was to devote my time to these two faculties.

My friends both in Pasadena and in Berkeley were mostly faculty people, scientists, classicists, and artists. I read very widely but mostly classics, novels, plays, and poetry; and I read something of other parts of science. I was not interested in and did not read about economics or politics. I was almost wholly divorced from the contemporary scene in this country.

I never read a newspaper or a current magazine like *Time* or *Harper's*; I had no radio, no telephone; I learned of the stock market crash in the fall of 1929 only long after the event; the first time I ever voted was in the Presidential election of 1936.

At Berkeley, Oppenheimer apprenticed himself to the late Professor Arthur Ryder, greatest Sanskrit student of his day. He and a handful of other students visited Ryder's house to share his Sanskrit learning and his Stoic faith.

Ryder taught Oppenheimer to read the Hindu scriptures in Sanskrit, his eighth language. He still reads them, "for his private delight" and sometimes for the public edification of his friends (the Bhagavad-Gita, its worn cover patched with Scotch tape, occupies a place of honor in Oppenheimer's study). He is particularly fond of one Sanskrit couplet: "Scholarship is less than sense, therefore, seek intelligence."

From Ryder, Oppenheimer also got a new "feeling for the place of ethics." Says Oppenheimer: "Ryder felt and thought and talked as a Stoic . . . a special subclass of the people who have a tragic sense of life, in that they attribute to human actions the completely decisive role in the difference between salvation and damnation. Ryder knew that a man could commit irretrievable error and that in the face of this fact, all others were secondary."

Many of Oppenheimer's friends found his indifference to contemporary affairs bizarre. "They often chided me with being too much of a high-brow. I was interested in man and his experience; I was deeply interested in my science; but I had no understanding of the relations of man to his society."

When awareness of this relationship came, it burst over Oppenheimer like a tropical fever.

Beginning in late 1936, my interests began to change. These changes did not alter my earlier friendships, my relations to my physics; but they added something new. I can discern in retrospect more than one reason for these changes.

I had had a continuing, smoldering fury about the treatment of Jews in Germany. I had relatives there, and was later to help in extricating them and bringing them to this country.

I saw what the depression was doing to my students. Often they could get no jobs, or jobs which were wholly inadequate. And through them, I began to sense the larger sorrows of the great depression. I began to understand how deeply political and economic events could affect men's lives. I began to feel the need to participate more fully in the life of the community. But I had no framework of political conviction or experience to give me perspective in these matters.

In the spring of 1936, I had been introduced by friends to Jean Tatlock, the daughter of a noted professor of English at the University; and in the autumn, I began to court her, and we grew close to each other. We were at least twice close enough to marriage to think of ourselves as engaged.

Between 1939 and her death in 1944 I saw her very rarely. She told me about her Communist party memberships; they were on-again, off-again affairs, and never seemed to provide for her what she was seeking. I do not believe that her interests were really political. She was a person of deep religious feeling. She loved this country and its people and its life. She was, as it turned out, a friend of many fellow-travelers and Communists, with a number of whom I was later to become acquainted.

I should not give the impression that it was wholly because of Jean Tatlock that I made left-wing friends, or felt sympathy for causes which hitherto would have seemed so remote from me, like the Loyalist cause in Spain, and the organization of migratory workers. I have mentioned some of the other contributing causes. I liked the new sense of companionship, and at the same time felt that I was coming to be part of the life of my time and country.

Father Oppenheimer died in 1937, and left his remarkable son a comfortable inheritance. He promptly made a will leaving the residue at his own death to the University of California for fellowships to graduate students. He also made other kinds of contributions.

This was the era of what the Communists then called the "united front," in which they joined with many non-Communist groups in support of humanitarian objectives. Many of these objectives engaged my interest.

I contributed to the strike fund of one of the major strikes of Bridges' union; I subscribed to *The People's World*; I contributed to the various committees and organizations which were intended to help the Spanish Loyalist cause. I was invited to help establish the Teachers' Union, which included faculty and teaching assistants at the University, and school teachers of the East Bay. I was elected Recording Secretary. My connection with the Teachers' Union continued until some time in 1941, when we disbanded our chapter. . . .

The matter which most engaged my sympathies and interests was the war in Spain. This was not a matter of understanding and informed convictions. I had never been to Spain; I knew a little of its literature; I knew nothing of its history or politics or contemporary problems. But like a great many other Americans I was emotionally committed to the Loyalist cause.

I contributed to various organizations for Spanish relief. I went to, and helped with, many parties, bazaars, and the like. Even when the war in Spain was manifestly lost, these activities continued. The end of the war and the defeat of the Loyalists caused me great sorrow.

It was probably through Spanish relief efforts that I met Dr. Thomas Addis and Rudy Lambert. As to the latter, our association never became close. As to the former, he was a distinguished medical scientist who became a friend.

Addis asked me, perhaps in the winter of 1937-38, to contribute through him to the Spanish cause. He made it clear that this money, unlike that which went to the relief organizations, would go straight to the fighting effort, and that it would go through Communist channels. I did so contribute, usually when he com-

municated with me, explaining the nature of the need. I gave him sums in cash, probably never much less than a hundred dollars, and occasionally perhaps somewhat more than that, several times during the winter. . . .

Later—but I do not remember the date—Addis introduced me to Isaac Folkoff, who was, as Addis indicated, in some way connected with the Communist Party, and told me that Folkoff would from then on get in touch with me when there was need for money. This he did, in much the same way that Addis had done before. As before, these contributions were for specific purposes, principally the Spanish war and Spanish relief.

Sometimes I was asked for money for other purposes, the organization of migratory labor in the California valleys, for instance. I doubt that it occurred to me that the contributions might be directed to purposes other than those I had intended, or that such other purposes might be evil. I did not then regard Communists as dangerous; and some of their declared objectives seemed to me desirable.

In time these contributions came to an end. I went to a big Spanish relief party the night before Pearl Harbor; and the next day, as we heard the news of the outbreak of war, I decided that I had had about enough of the Spanish cause, and that there were other and more pressing crises in the world. My contributions would not have continued much longer.

Oppenheimer's brother Frank married in 1936. Sometime in 1937 he had told Robert that he and his wife Jackie had joined the Communist Party. The brothers did not see as much of each other as before but they continued to spend summer holidays together. In the summer of 1941 Frank and his wife moved to Berkeley, where Frank worked for the University's Radiation Laboratory (where Edward Teller years later made large contributions to the thermonuclear weapons program). At the time, Frank "made it clear" to brother Robert that he was no longer a member of the Communist Party.

In the summer of 1939 Robert Oppenheimer met his wife.

She was married to Dr. Harrison, who was a friend and associate of the Tolmans, Lauritsens, and others on the California Institute

of Technology faculty. I learned of her earlier marriage to Joe Dallet and of his death fighting in Spain. He had been a Communist Party official, and for a year or two during their brief marriage my wife was a Communist Party member. When I met her, I found in her a deep loyalty to her former husband, a complete disengagement from any political activity, and a certain disappointment and contempt that the Communist Party was not in fact what she had once thought it was.

My own views were also evolving. Although Sidney and Beatrice Webb's book on Russia, which I had read in 1936, and the talk that I heard at that time had predisposed me to make much of the economic progress and general level of welfare in Russia, and little of its political tyranny, my views on this were to change.

I read about the purge trials, though not in full detail, and could never find a view of them which was not damning to the Soviet system. In 1938 I met three physicists who had actually lived in Russia in the 1930's. All were eminent scientists: Placzek, Weisskopf, and Schein; and the first two have become close friends. What they reported seemed to me so solid, so unfanatical, so true, that it made a great impression; and it presented Russia, even when seen from their limited experience, as a land of purge and terror, of ludicrously bad management and of a long-suffering people.

I need to make clear that this changing opinion of Russia, which was to be reinforced by the Nazi-Soviet pact, and the behavior of the Soviet Union in Poland and Finland, did not mean a sharp break for me with those who held to different views. At that time I did not fully understand—as in time I came to understand—how completely the Communist Party in this country was under the control of Russia. During and after the Battle of England the next autumn, I found myself increasingly out of sympathy with the policy of disengagement and neutrality that the Communist press advocated.

Because of these associations that I have described, and the contributions mentioned earlier, I might well have appeared at the time as quite close to the Communist Party—perhaps even to some people as belonging to it. As I have said, some of its declared objectives seemed to me desirable. But I never was a member of

the Communist Party. I never accepted Communist dogma or theory; in fact, it never made sense to me.

I had no clearly formulated political views. I hated tyranny and repression and every form of dictatorial control of thought. In most cases, I did not in those days know who was and who was not a member of the Communist Party. No one ever asked me to join the Communist Party.

The Robert Oppenheimers moved from the campus at Berkeley to Los Alamos in 1943 to take over the organizing and directing of the super-secret laboratory that would produce the first atomic bomb. From this point their association "with left-wing circles" would cease, he says, "never to be re-established."

Chapter 4

\$2,400 BARGAIN

DR. OPPENHEIMER became world famous for the work he and his associates accomplished under great pressure at Los Alamos during World War II. Edward Teller also worked at Los Alamos during the war. But because Oppenheimer did not like him personally—a fact that was perhaps traceable to their differing political views—Teller was denied a specific job in connection with the development of the atomic bomb.

Thus, while Oppenheimer and his men concentrated on the detail work of actually putting together an atomic bomb, Teller, who was assigned a corner in the Theoretical Division, was left free to think. It was in a sense a rare opportunity. Not many scientists in the free world at that moment of history were permitted the luxury of thinking.

Teller put his thinking time to good use. His mind ranged across the broad spectrum of atomic energy; he foresaw and planned for benign uses of the atom, such as the reactor to make electric power, and the use of isotopes in medicine. He thought of new and different methods of making atomic weapons and urged that the U.S. never slacken this effort because he believed it essential to freedom. In the quiet of his laboratory, Teller conceived a wholly new type of nuclear bomb, one that could be a thousand times as powerful as the atomic bomb.

In the regimented community at Los Alamos dominated by Robert Oppenheimer, Edward Teller was not a very happy man. This was not a new story for Teller.

Teller was born in Budapest in 1908. The only son of a middle-class Jewish lawyer who lived in Pest (two blocks from the Danube), he was reared in relatively handsome circumstances, having until the age of ten, a private tutor. A brilliant sensitive lad, in the middle-class fashion of the time, Edward learned classical piano and then went on to gymnasium, or high school, with the other students.

His childhood was lived under both modern varieties of political tyranny, the Communism of Béla Kun, the Fascism of Admiral Horthy. He saw five revolutions. Dead men in the streets, constant insecurity were "normal" to the act of living for Edward Teller. In addition the Teller family bore the weight of anti-Semitism. Teller recalls that from his earliest consciousness it was clear that in the family plans he would someday emigrate from Hungary to a better political climate. He understood that the "only way I would be able to get along would be that I should be smarter than somebody else."

Far superior intellectually to his classmates, Teller did not easily adjust to the slow-moving pace at the gymnasium. Moreover, the strict discipline of the public-school system worked against his grain. After high school, Teller happily moved on to the Institute of Technology in Budapest, and for a while studied pure mathematics. His father objected to the course of study on the grounds that it was not practical. He suggested instead that son Edward study chemistry. Teller finally, and reluctantly, agreed to compromise with his father, and settled on physics. "Intellectual snobbery was the fashion in Budapest at the time. The more learnedly abstract, the better," Teller recalls.

Having established a brilliant record at the Institute of Technology in Budapest, Teller persuaded his father to send him on to the center of higher education in Europe at the time: Germany. Teller studied at Munich, Karlsruhe, and

finally took his doctor's degree at Leipzig. Later he was a research associate in Göttingen.

In Berlin Max Planck had just published his theory of quantum mechanics, a mathematical system that has advanced the twentieth-century concept of the universe even further than the theory of general relativity. As Teller says, it suddenly explained "almost everything, in physics, chemistry, almost everything in the world that we had wondered about." Yet it is an incredibly difficult intellectual discipline. "I was exposed to quantum mechanics when it was two years old and I was twenty years old," Teller says. "Even so I found the struggle a little unequal."

Meantime, Teller had been carrying on serious correspondence with a childhood sweetheart named Mici who went to school with Teller's only sister and lived several doors from the Tellers in Budapest. Mary Augusta, "Mici," the daughter of a pediatrician, used to bring Edward into her house in Budapest on the pretext of needing help with her algebra. Mici's father disapproved, but the romance flourished in this academic climate.

Mici had gone to study in the United States. When she returned in August of 1933, it was finally agreed that she and Edward would be married. There was a slight complication, since Adolph Hitler was making it uncomfortable for men of Teller's background to live in Germany. Teller decided to move on to Copenhagen, where other Jewish physicists and scientists who had left Germany had settled. He learned that there was a good chance that he could receive a U.S. Rockefeller scholarship, and after making final plans with Mici to be married in December, he went to Copenhagen.

After seeking out Niels Bohr and other senior scientists, Teller decided definitely to settle in Copenhagen. But, then, another complication developed: the Rockefeller Foundation, with an inexplicable bit of logic, decreed that young scientists receiving scholarship grants could not be married.

The new ruling caught Teller in a heart-wrenching di-

lemma. Would he stay in Bohr's Copenhagen or go back to Budapest and marry Mici, and perhaps spend his life teaching at the dismal institute in Budapest? Teller caught a train for Paris in order to talk personally with the Rockefeller officials.

In Paris, Teller found the Rockefeller officials cordial but firmly set against awarding scholarships to married, junior scientists. "We don't want you to get the idea that we are opposed to the institution of marriage in the U.S.," the Rockefeller official explained. "It's just that we have found that scientific work and marriage are incompatible."

Later Teller limped * to a telephone and put through a long-distance call to Mici, and, distraught, explained the problem that he faced. Teller left it up to Mici. Unselfishly she agreed to postpone the marriage until some sort of compromise could be worked out with the Rockefellers.

Back in Copenhagen, after he had accepted a \$2,400 scholarship, Teller persuaded some of his noted associates such as Bohr to write the Rockefeller Commission and ascertain why he could not hold the scholarship and also be married. At length, the Rockefeller administrators broke down and wrote asking Teller to please inform them of the date of his marriage. Says Teller: "I could not comply without getting married, so I did." Teller prides himself on the fact that he wrote his first important paper on nuclear physics after he was married.

Still supported by Rockefeller Foundation grants, Teller went on to spend a year in Britain at the University of London, studying and working under Dr. F. G. Donnan, the noted biochemist. Then, having become widely known in scientific circles through his work on the Rockefeller Foundation, Teller attracted the attention of two U.S. universities. Princeton offered Teller a fellowship; George Washington (in Wash-

* Teller walks with a stiff-legged limp. At the age of twenty, while studying in Munich, he jumped off a street car, slipped under a wheel, and lost his right foot just above the ankle. He wears a leather foot, which is no impediment to such favored athletic pursuits as swimming and even climbing the New Mexican mountains around Los Alamos.

ington, D.C.) offered him a full professorship. Teller accepted the latter offer, and in 1935, moved to the United States, where he has lived ever since.

Established in the United States in comfortable circumstances at George Washington University, Dr. Teller settled down to do some serious academic work. He soon came into close contact with George Washington's popular Dr. George Gamow, from whom Teller developed his greatest talent: the ability to express himself with clarity and simplicity.

Gamow, who prides himself on being lazy, was unnerved by Teller's energy. Instead of settling into a comfortable chair in contemplation, Gamow recalls, Teller at once sought out other physicists for trained minds against which to pit his inexhaustible stream of ideas. At the University of Chicago in a later period of his academic life, the phenomenon of Teller's energy was given a physicist's definition. Human energy and enthusiasm were measured by the yardstick of Teller's output, not directly but in fractions of millionths of Teller's emission, or "micro-Tellers."

By 1939, Teller had built up a solid reputation in scientific circles (he was just thirty-one years old) through the publication of half a dozen papers that he prepared with other scientists.* His friends and associates were, in addition to Gamow, Dr. Lawrence Hafstad, Leo Szilard, and John Wheeler.

Early in that year, young physicist Teller was required to give a lecture. The subject of nuclear energy was being widely discussed. Accordingly, Teller felt compelled to go on record concerning the possibility of obtaining energy from the heart of the atom. He recalls proudly that he told his audience such energy was "apparently impossible" to obtain, rather than simply "impossible," like most of his colleagues. It was later that year that the two German physicists, O. Hahn and F. Strassman, split the atomic nucleus.

* One of the unusual characteristics of Teller is that he has never published a paper alone. He prefers to publish with a colleague, to whom he gives all the credit for the paper.

In nature's strange and mysterious way, early twentieth-century Budapest sprouted physicists in a bumper crop. Besides Teller, and contemporary with him, the embattled city produced Leo Szilard, Eugene Wigner, John Von Neumann, among the scientists most instrumental in producing history's first atomic bomb. It was thus mathematical probability that a Hungarian would be the first to seize on the German discovery that the uranium atom could be made to split. Leo Szilard fled Germany at considerable risk to himself to pass the news to Niels Bohr in Copenhagen, who in turn relayed it to friends in the United States. It was Szilard who in July, 1939, visited Albert Einstein at Princeton to enlist his towering prestige in the attempt to persuade President Roosevelt to throw American resources into a mighty effort to build the atomic bomb.

Einstein agreed to sign a letter, which Szilard and Wigner would prepare, but by the time it was ready he had gone for a vacation to Peconic Bay, far out on Long Island. Wigner had pressing business and could not drive out with the letter. Szilard did not know how to drive. In the emergency he sought the help of another Hungarian, Teller. They set out on the second of August and with difficulty found the great mathematician relaxing in a bathrobe and slippers at his cottage. He signed the letter with the prophetic prediction that man for the first time would soon employ energy not given in one way or another by the sun.

It was during the early work on the atomic project at Los Alamos that Teller first began to think about a super atomic bomb, of a new order of magnitude beyond the work at hand. Teller is widely known as "an order of magnitude man." How tall is man? Ignoring the fact that man can range from a few feet tall to seven or more, Teller would say: "Man is of the order of one and three-quarters meters tall."

The new order of magnitude of atomic energy grew into Teller's thinking as a result of his earlier work with Gamow, work that had led indirectly to a significant paper published

by the eminent Hans Bethe on the source of the energy of the stars. At George Washington University, Gamow had been interested in this phenomenon and had discussed the matter with his brilliant associate, Teller. Together they worked out theoretical formulas for certain kinds of thermonuclear reactions (atomic disintegration at high temperatures or alchemical burning, as Gamow called it). Bethe, already one of the great men of physics, came down to Washington to a conference Gamow had called. He stayed at Teller's house and heard of the work Gamow and Teller were doing. Bethe thought about it on the train returning home, Gamow says. He continued to think about it and soon published his significant work, which eventually led the way to the concept of a thermonuclear or hydrogen bomb.

The stars, Bethe calculated, burned the lightest element, hydrogen, into the next element on the atomic scale, helium. The process actually took place only in the interior of the stars where temperatures reached millions of degrees. Even at these temperatures the fusion of hydrogen into helium was a reaction of several million years' duration.

To approximate this process on earth, which is literally what Teller hoped to do, much hotter temperatures were required, perhaps as much as five or ten times the temperature of the interior of the sun. Even then ordinary hydrogen—such as might be used to inflate a circus balloon—could not be burned in a superbomb. But hydrogen had two less stable isotopes (heavier forms of the gas) known as deuterium and tritium. Deuterium occurred in nature and combined chemically with oxygen to form “heavy” water. Tritium had not occurred naturally on earth for possibly a billion years.

The successful detonation of the atomic bomb at Alamogordo on July 16, 1945, furnished strong indication that sufficient temperatures could be generated in an atomic explosion to ignite a mixture of the two isotopes of hydrogen, deuterium and tritium.

Encouraged, Teller and his assistants went back to the

laboratory in high hopes. In the summer of 1945, Teller, assisted by Robert Oppenheimer, drew up a report on the H-bomb for Secretary of War Henry Stimson's special "Interim Committee." The report declared that the superbomb was probably feasible and urged that the U.S. proceed with the development of such a bomb.

It was generally understood at Los Alamos that the next large-scale laboratory effort would be the hydrogen bomb. Fermi was to head the effort; Bethe and Teller were to be his key assistants. Fermi had already begun a series of lectures as a preliminary to the new program.

Then, in August, 1945, with Hiroshima and Nagasaki, came the end of World War II. Oppenheimer, who had worked so hard to organize Los Alamos, suddenly began urging that it be abandoned. Work on weapons was sharply curtailed. The scientists went back to the universities and colleges. Practically alone, Edward Teller remained for a while at Los Alamos in a vain attempt to push his superbomb through to completion before the laboratory disintegrated completely.

Dr. Norris Bradbury, who succeeded Oppenheimer as Director of Los Alamos, later approached Teller and asked him if he would remain to direct the Theoretical Division. Teller, who was still anxious to push his bomb through to completion, answered that he would stay provided one of two conditions was met: (1) either that the laboratory launch a vigorous fission-weapons program contemplating the testing of at least twelve weapons a year, or (2) that the laboratory concentrate on a thermonuclear program.

Bradbury replied that the programs were out of the question.

Chapter 5

THE PHYSICISTS HAVE KNOWN SIN

THE DESIRE TO return to private life from the government laboratories was understandable. Every theoretical physicist prefers the campus and pure research to the black art of "applications," as he terms weapons development. Life at Los Alamos was tense and strained, almost quasi-military.

Moreover, a large segment of the U.S. was morally uncertain at war's end over the act of having created and used a weapon with the killing power of the atomic bomb. This uncertainty spread quickly through the ranks of the atomic scientists and soon became a chorus of remorse articulated most eloquently of all by Dr. Oppenheimer.

Soon after the war Oppenheimer proposed abandonment of the weapons laboratory entirely and was widely quoted as suggesting that the U.S. "give Los Alamos back to the Indians." In one single sentence he offered himself as spokesman for the conscience of the atomic physicists:

"In some crude sense, which no vulgarity, no humor, no overstatement can quite extinguish, the physicists have known sin and this is a knowledge which they cannot lose."

On one occasion, at the White House, Oppenheimer had

wept in the presence of President Harry Truman because of the "blood on our hands."

But Oppenheimer was by no means the only spokesman for the tortured conscience of U.S. atomic scientists.

Professor E. A. Shils, a member of the Board of the *Bulletin of Atomic Scientists*, has described the attitude of his colleagues:

The detonation of the first atomic bomb against the Japanese in August, 1945, was greeted with great enthusiasm by most journalists and by the population at large. Only a small proportion of the population saw the catastrophic possibilities, and these people were mainly scientists who had been at work on the bomb over the preceding seven years.

A group of scientists, numbering about a thousand, formed the nucleus of a great effort to modify American opinion. Of these, only a few hundred were really very active. This action taken by American physical scientists was unprecedented. For the first time, scientists on a grand scale showed awareness of the effects of their work and a sense of responsibility to prevent its misuse. Their fervor came partly from their deep and guilty insight into what the bomb could do, partly from their startling discovery of their political potency, and partly from their long-rankling dissatisfaction and uneasiness over the military's regimentation of their scientific skills for the purposes of destruction.

The mood of this faction of the atomic scientists was almost irreconcilable. The average citizen, himself shocked by the enormity of Hiroshima, was not quite prepared for the guilt of Los Alamos.

These scientists, it developed, had contributed their genius in what they conceived as a total effort against total evil in the form of Adolph Hitler. When Hitler was cremated in a gasoline fire in the garden of the Reichschancellery, a sense of having created an unnecessary evil overwhelmed them. Some could not trust their own government with such a weapon.

Szilard wrote:

During 1943 and 1944 our greatest worry was the possibility that Germany would perfect an atomic bomb before the invasion of Europe. In 1945, when we ceased worrying about what the Germans might do to us, we began to worry about what the government of the United States might do to other countries.

The immediate target of the scientists' lobby was the May-Johnson bill, the Administration's original, or pre-McMahon, bill for the control of atomic energy. Because it contained provisions for military participation and enforcement of security rules, the scientists branded it militaristic and opened a campaign against it. An analysis has been made of the campaign by James R. Newman and Byron S. Miller, in their *The Control of Atomic Energy*. These two legal advisers to the original Senate Atomic Committee wrote:

The first to sound the alarm were the scientists. . . . Sensitive as one of their own Geiger counters, they had registered an immediate and powerful reaction to the May-Johnson bill . . . and shortly after its introduction the vanguard of the army they mobilized appeared in Washington and began to draw plans for the fray.

This was a unique manifestation in the history of science in the United States. The traditional position of American scientists could be adequately summarized in Hooke's famous, if over-cautious, recipe for the Royal Society—to improve the knowledge of natural things and all useful arts, but not to “meddle with divinity, metaphysics, morals, politics, grammar, rettorick or logick.” But now in large numbers they swarmed down from their ivory towers, and with energy, fervor, passionate conviction, and a somewhat unexpected talent for organization threw themselves into the battle. It may be that they were grossly naïve in politics, but there is no denying that they showed a capacity for improvisation and prompt action beyond anything the economic groups whose interests were vitally involved in the legislation were able to muster. . . .

The scientists were first to enter the field and they remained throughout in the forefront of the battle. They formed their own local groups throughout the country; they helped in the formation of citizens' committees; they furnished data to Congressmen, publicists, and commentators. It was not long before they were joined by a large and variegated army, which it would have been difficult to unite in any other cause. In the ranks could be found representatives of every shade of political opinion, from radicals whose position might be taken for granted to true conservatives. . . . Newspapers of every gradation of political opinion condemned the military features of the May-Johnson bill. Professional societies, women's clubs, church federations, labor unions, veterans' groups, and university students adopted resolutions denouncing the provision. Letters and telegrams of protest poured into the White House and offices of the Congressmen; the Senate Special Committee alone received over 75,000 messages, of which the overwhelming majority opposed [specific military provisions of the bill]. . . .

In the fight for civilian vs. military control of the atom, Dr. Oppenheimer became an important factor. Though originally in favor of the "military" May-Johnson bill, he switched and helped push through the scientist-sponsored McMahon bill for control of atomic energy.

Turning to another goal, Oppenheimer was the dominant author of the 1946 Acheson-Lilienthal plan for international atomic control. As originally written, the plan called for construction of atomic facilities within the Soviet Union, possibly including weapons facilities, and did not deny the Soviets the veto power in matters relating to atomic energy.

A few men in the government noted with alarm that the campaign in some respects was not in what they conceived to be the best interests of the United States.

The Secretary of the Navy, James V. Forrestal (later first U.S. Secretary of National Defense), wrote in his diary:

Mr. Byrnes indicated that he was most strongly opposed to imparting any of this information to the Russians. He stated that

he felt that undue emphasis was being given to the views of the scientists on this subject. He said that while it was all very well for the scientists to say as they did that science had no boundaries, that certainly did not apply to either Mr. Molotov or Mr. Stalin; that in his view it is idle to expect that we would be allowed any access for purposes of inspection of Russian factories producing atomic bombs. . . .

Clearly, the production of conventional atomic weapons was not vigorously pushed following World War II. In fact, after the scientists deserted Los Alamos, there was a serious effort made to shut down the laboratory and cease weapons production altogether. For example, the *New York Times* of February 16, 1946, carried a letter as follows:

To the Editor of the *New York Times*:

. . . We would like to suggest a declaration of policy of the following nature by the President of the United States . . .:

1. The United States will at once stop the production of bombs from material currently produced. . . .

2. For one year . . . we will stop accumulating purified plutonium and uranium-235. . . . As produced, these will be eliminated by appropriate means, such as dumping them into the ocean or returning them to their original mixtures.

3. We are prepared to have the disposition of our present stockpile of bombs considered as one of the items in an agreement to be entered into by us and the other governments.

The letter was signed by a number of outstanding U.S. scientists, educators, and physicists, including I. C. Dunn, Irwin Edman, A. P. Evans, Selig Hecht, P. C. Jessup, R. M. MacIver, Edgar Miller, F. C. Mills, George B. Pegram, I. I. Rabi, Jan Schilt, and C. S. Schoup.

This policy was not adopted. But in actual practice, the sense of it governed. Hardly any atomic bombs were made during 1946, the year following publication of the letter. The majority report of the Joint Committee on Atomic

Energy published in 1949, following its investigation of Senator Hickenlooper's charges against David Lilienthal of "incredible mismanagement," had this to say:

Uncontradicted testimony shows that in 1947, when responsibility was formally transferred from the Manhattan Engineer District to the Commission, our weapons position verged on the tragic. The United States then possessed so few bombs, according to Mr. Lilienthal, that we might have tempted fate if public statements even mentioned the importance of numbers in building an atomic deterrent to aggression. Dr. Robert F. Bacher, an original member of the Commission, and now Chairman of the California Institute of Technology Physics Department, told the Joint Committee that he personally made an inventory of our stockpile early in 1947 and that he was both surprised and "very deeply shocked by the meager findings."

In these same hearings, Oppenheimer had been asked by McMahon: "Are you satisfied with our weapons progress since the end of the war?" Oppenheimer replied: "It is my business not to be satisfied, but I am."

One goal of the antiweapons campaign waged by the scientists in Washington in 1945 and 1946, it seemed, was to create the impression that Teller's "superbomb" was not feasible or practicable. In the fall of 1945, after leaving Los Alamos, Oppenheimer, in a second report to Stimson's "Interim Committee," reversed his earlier report on the "super," and urged that the program be discontinued.

During the atomic hearings on the McMahon bill in Congress, Oppenheimer was asked about other methods of releasing atomic energy. In reply, Oppenheimer referred to Dr. Bethe's theory that the sun's energy derives from a series of fusion reactions involving light nuclei, and said: "It is conceivable that development of this kind might be carried out terrestrially but I am sure I don't know how, and I do not think it is an immediate prospect nor a very likely one. So

my answer—a rather long answer—is to the best of my knowledge, ‘No.’ ” *

Teller, who, as Oppenheimer knew, was at least within sighting distance of a successful H-bomb, was baffled by the attitude of his brother scientists. He hurried to Washington to testify in a different vein: “The atomic bomb is in its earliest infancy and even a moderate amount of work may improve it considerably. Future bombs may become less expensive, may be easier to handle, and they may have a much greater destructive power. *I am convinced that it will not be very difficult to construct atomic bombs which will dwarf the Hiroshima bomb in the same way that bomb has dwarfed high explosives.*” (Authors’ italics.)

Against Oppenheimer, Teller’s views had no weight. Immediately after Teller spoke, the Committee adjourned. Teller went back to Los Alamos.

While other atomic physicists remained in Washington working to help create a new world state and a new order of society in which there would be no wars, no atomic weapons, no atomic secrets, Teller worked away quietly at Los Alamos, in a last-minute attempt to retain the services of some of the departing scientists, so that he could push forward with the superbomb. He met with no success.

In early 1946, he returned to Washington and again spoke to a Congressional committee: “The main fact I want to call to the attention of the Committee is this: since the surrender of Japan, the scientific and technical development of atomic energy has *practically come to a standstill*. Many feel that with the successful conclusion of the war there is no further need to develop atomic bombs. Development of atomic bombs must depend on the international situation. *As a scientist I*

* Curiously, a few weeks earlier, on leaving the Los Alamos laboratory, when asked by a newsman whether the A-bomb had any significant limitation, Oppenheimer replied: “The limitations lie in the fact that you don’t want to be on the receiving end. If you ask, ‘Can we make them more terrible?’ the answer is yes. If you ask, ‘Can we make them terribly more terrible?’ the answer is probably.”

do not think that I am in a better position than the average citizen to make a recommendation on the desirability of production of weapons. But many people will agree that peacetime work should proceed." (Authors' italics.)

As a final try at saving the superbomb program, Teller and Fermi organized and conducted at Los Alamos in April, 1946, a meeting of thirty top U.S. nuclear physicists. The report on the conference was issued in June. The conferences, which later became known as "The Final Conferences on the Super," were conducted as seminars on the hydrogen bomb. The purpose of the conferences was to make it clear that the hydrogen bomb was technically feasible and practicable.* Among the thirty physicists who attended these "Final Conferences on the Super," was unfortunately one physicist who later became infamous. His name was Dr. Klaus Fuchs.

This dramatic, last-minute effort failed to spur the government into proceeding further with the H-bomb. The influence of Oppenheimer and his associates was too great. The conference reports, one of which described in detail how a hydrogen bomb could be assembled within two years' time, were forwarded to Washington for a decision by the highest levels of the government. But no decision was ever forthcoming. The reports did not even reach President Truman's desk. They were filed away in the AEC, and to all practical purposes, forgotten.

Dr. Teller was advised by Enrico Fermi not to weary himself by working on atomic weapons in peacetime, especially when it was obvious that the government had no interest. Fermi invited Teller to join him at the Physics Department at the University of Chicago, and Teller accepted. After three years at Los Alamos, he departed, greatly concerned because the program had been allowed to die.

In the quiet, academic atmosphere at Chicago, Teller, who could not get his mind off the badly lagging U.S. atomic-

* The report also noted possible peacetime power application of the thermonuclear weapon.

weapons program, kept plugging away for his now derelict H-bomb program whenever the opportunity presented itself. Many scientists branded him a warmonger.

In 1947 in the *Bulletin of Atomic Scientists*, Teller wrote:

Actually it is quite unsound to limit our attention to atomic bombs of the present type. These bombs are the results of our first attempts and they were developed under wartime pressure. The paramount consideration had to be: which of the developments promised earliest results. In a subject as new as atomic power we must be prepared for startling developments. It has been repeatedly stated that future bombs may easily surpass those used in the last war by a factor of a thousand. I share this belief.*

From Chicago, Teller continually bombarded his friends in Washington. In the fall of 1947, he wrote Dr. Lawrence Hafstad, Chairman of the Defense Department Research and Development Board: "Perhaps I am overenthusiastic but I think that we have lots of good, long-range plans—what we really lack is the push toward short-range objectives of which there was so much during the war, and of which there is so little now." Teller complained because his H-bomb program was "up in the clouds."

During 1948 and 1949, the hydrogen-bomb program, in spite of increasing Russian intransigency and Teller's vigorous needling and prodding, remained derelict. In 1948, the bomb was discussed briefly in a Department of Defense ten-year "objectives study," but dismissed by Committee Chairman J. Robert Oppenheimer as "long-range" and beyond the capabilities of the Atomic Energy Commission. At about the same

* In December, 1946, speaking before a group of insurance underwriters, former Assistant Secretary of War John J. McCloy said: "I have been told by scientists who are not mere theorists but who actually planned and made the bomb which was exploded in New Mexico that, given the same intensive effort which was employed during the war toward production of that bomb, we were within two years' time at the close of the war of producing a bomb of the hydrogen-helium type, i.e., a bomb of approximately one thousand times the power of the present bombs."

time, the AEC's General Advisory Committee, under Chairman Oppenheimer wearing another of his many hats, recommended against a hydrogen-bomb program, and gave as the basic reason the fact that the Defense Department had not asked for it. Dr. Oppenheimer as GAC Chairman wrote that the panel report (Dr. Oppenheimer, Chairman) was a fine job.

There for four years the superbomb rested—largely because nobody in the United States Government had been able to mobilize the intellectual and moral energy necessary to overcome the resistance to it.

"The physicists have known sin," Robert Oppenheimer explained. He meant that U.S. scientists had created a military weapon capable of killing human beings on a scale never before imaginable. In this act alone they had acquired a guilt they could not lose.

Mr. Churchill, who, at one time in his long career of public life at least, was to politics what Oppenheimer was to physics, had seen another side of this coin. Were it not for the atomic bombs U.S. physicists had created, he suggested, all Europe would have been subjugated, by 1948, by Communist Russia, a police state in the grip of a tyrant who rejected the concept of moral right and wrong, the concept of liberty. Who weakened this U.S. position of weapons superiority, he warned, "would be guilty of murdering human freedom."

Not in Oppenheimer's context, Churchill's words suggested, but in an even more lofty one, the scientists had known sin. They had handicapped the free nations in their struggle with Soviet Communism by withholding their knowledge and genius from thermonuclear-weapons development in the years between World War II and Korea.

If so, the degree of sin is, in this case, measured not in vague abstractions, but in the allied casualties in Korea, in the tortures of brain-washing, in the sufferings of an entire nation ripped open in war.

For it is now reasonably clear that as soon as the Soviets knew they had the atomic bomb in their weapons locker, they felt free to begin direct preparation for armed aggression in Korea. It requires little exercise of imagination to guess their reaction had they learned at this time that the United States had progressed to a new weapon one thousand times as powerful as their own "Joe One."

Chapter 6

FOR A CRASH PROGRAM

HAPPILY FOR THE free world not all U.S. physicists were paralyzed by the guilt of Los Alamos. There was a minority, extremely small in numbers but vigorous in anxiety over the future of a nation that failed to look to its atomic weapons. Ironically, most * of these scientists were associated with the sprawling University of California at its Berkeley campus, where Dr. Oppenheimer in the prewar years had learned his first politics and developed his Communist associations. When they heard the news of "Joe One," these scientists remembered the appeals of Edward Teller.

The most important member of this tiny group was the energetic, absent-minded developer of the cyclotron and its important successors in the mechanics of atom smashing, Dr. Ernest Orlando Lawrence, Professor of Physics at the University of California at Berkeley. Lawrence, who combined shrewd administrative ability with political savvy (and a weakness for the capitalistic comforts of U.S. life such as chauffeur-driven Cadillac convertibles), was also Director of the University of California's Radiation Laboratory, a major

* Dr. Karl Compton, the late great president of the Massachusetts Institute of Technology, wrote a letter to President Truman at about this time urging an all-out effort to build the hydrogen bomb.

AEC facility operated by the University under contract with the Commission.

Several days after the White House announcement, Lawrence was at lunch at the Faculty Club in Berkeley with a colleague, Dr. Wendell M. Latimer. Like many other scientists that week they discussed the news of "Joe One." As they left the Faculty Club, Latimer said to Lawrence: "We ought to get busy right away with the thermonuclear program." Lawrence agreed.

Several hours later, Lawrence went up on the "Hill" at Berkeley for a chat with his friend and fellow scientist, Dr. Luis W. Alvarez. Lawrence found that Alvarez like Latimer was strongly in favor of investigating the thermonuclear program. That afternoon, the three men agreed to press their views on the U.S. Government, when they arrived in Washington the following week on a scheduled trip.

Later, by telephone that evening, Lawrence and Alvarez began a search for Edward Teller. They found him at Los Alamos. At the time of the announcement of "Joe One," Teller was just returning from a short trip abroad. He heard the news while passing through Washington on his way back to the University of Chicago. Teller had called Oppenheimer to get his reaction. Oppenheimer told Teller to "Keep your shirt on," and advised him to go to Los Alamos to do what he could for the work there (the weapons laboratory was then engaged exclusively in fission bomb research).

The telephone connection was not good from Berkeley to Los Alamos. After a brief conversation, Lawrence and Alvarez decided it would be to their advantage to leave for Washington a day early and stop off at Los Alamos for a talk with Teller. Much had happened in four years. They needed refreshing on the technical aspects of the problem. They left San Francisco by plane at seven thirty that evening.

They arrived at Albuquerque at 3:00 A.M. and spent the remainder of the night at the Hilton Hotel. The following morning, they boarded the CARCO Airline, the small con-

necting airline to Los Alamos, and soon were talking with Teller. Teller informed Lawrence and Alvarez that the project had a good chance of success, provided a supply of tritium could be made available. Machine calculations would have to be made to check the thermodynamics. Before leaving Los Alamos that evening, Lawrence received assurance from Teller that Los Alamos and Princeton would begin the machine calculations immediately.

That evening, Teller, Lawrence, and Alvarez flew back to Albuquerque and talked in their room at the Hilton until bedtime. The three men agreed that a mass meeting of top U.S. physicists ought to be called at Los Alamos immediately to discuss the thermonuclear bomb. Before going to bed, Teller suggested that a heavy-water pile, such as the Canadian pile at Chalk River, might provide an easy way to obtain a good supply of neutrons (it would produce more neutrons than the ordinary graphite piles)—required for making the necessary tritium. Lawrence replied that he would get going on that at once. Then Lawrence and Alvarez left Albuquerque at 3:30 A.M. for Washington.

As operators of a major AEC installation, the California scientists felt a personal responsibility for the atomic progress and security of the U.S. Since they were among a handful of Americans who knew about the possibility of a hydrogen bomb, they did not feel at all presumptuous in attempting to get such a program underway.

On the afternoon of October 8, Lawrence and Alvarez arrived in Washington and went directly to the Atomic Energy Commission. Bursting with enthusiasm and their plan to build heavy-water piles to secure extra neutrons, they went to see Dr. Dean Kenneth Pitzer, Director of Research, and Major General James MacCormack, head of the Military Applications Division of the AEC. Later they joined with their colleague, Wendell Latimer, who had already contacted Drs. Harold C. Urey and Willard F. Libby in Chicago, and went to see Pitzer's administrative assistant, Dr. Paul Fine. The

three men received enthusiastic support everywhere but in the office of Paul Fine. Alvarez simply put him down as a person with essentially no imagination and discounted him.

Bright and early the following day, Alvarez and Lawrence had breakfast with Robert LeBaron, who was an assistant to the Secretary of Defense for atomic matters. They outlined their plan for obtaining more neutrons.* LeBaron seemed enthusiastic.

The following morning, Monday, October 10, the two scientists went back to the Atomic Energy Commission to arrange clearance into the Canadian heavy-water pile at Chalk River. They found all of the Commission except Strauss lukewarm and unhappy about their proposed trip to Chalk River. Strauss showed Lawrence and Alvarez his October 5 memorandum. It soon became apparent to Lawrence and Company that the AEC was not enthusiastic about a thermonuclear program.

From Lewis Strauss, Lawrence and Alvarez learned that the greatest hope of action on an H-bomb program lay in the powerful Joint Congressional Committee, Chairman Brien McMahon, and ranking minority member Hickenlooper. McMahon, Strauss reported, had already entered the struggle on the side of the hydrogen-bomb program and had designated one of his special staff assistants to carry the fight for the Joint Committee. When McMahon had first read Strauss's memorandum, Lawrence later learned, he had turned to his trusted staff assistant, William Liscum Borden, who was also executive director of the Joint Committee, and said:

"Bill, we're going all out on the H-bomb and nothing is to stand in the way."

Borden was just twenty-eight. The story of how he had, at this young age, become one of a small group of men on whom the nation's weight in the world power struggle would depend began one black night in November, 1944. Borden

* At noon that day, Lawrence received word that his wife had had a baby.

was flying a light, stripped-down B-24 Liberator over the Channel toward the English coast. He had just dropped a supply of explosives to allied underground agents in France. Suddenly the cockpit glowed with a crimson glare. "I thought the flash must have come from a gasoline explosion in the plane." Then Borden and his crew knew they had been passed by a German V-2 rocket on its way to London. "Our plane seemed to stand still," he said later.

Borden never got out of his mind the speed of the rocket as compared with the wallowing pace of his Liberator. He returned to Yale after the war to finish his law course. Before he could settle down to practice, however, he wrote a book on the effect of atomic weapons and rocket delivery on military strategy and the world balance of power. *The Revolution in Strategy* Borden titled it. His publishers called it *There Will Be No Time*. The book was the first to advocate atomic weapons by the thousands for tactical use against military bases. It caught the attention of Brien McMahon and other members of the Joint Committee. McMahon brought Borden to Washington.

When Borden learned that Lawrence and Alvarez were in Washington advocating a "crash" hydrogen-bomb program, he quietly arranged a lunch for the two scientists, Joint Committee Chairman Brien McMahon, himself, and one other H-bomb advocate, committee member Representative Carl Hinshaw.

It was a memorable lunch.* Lawrence, fresh from Los Alamos, was well prepared. The main line of his argument was: The U.S. must assume that the Soviets are building a hydrogen bomb along with their development of the atomic bomb and that it may be a question of only a few weeks or months before the Soviets explode such a bomb.

To hedge against this possibility, Lawrence argued, the

* Later Lawrence and Alvarez were criticized for attending the luncheon by AEC bureaucrats who charged that the scientists had "gone over the head of AEC to Congress" in order to lobby for the H-bomb.

U.S. must initiate immediately a hydrogen-bomb program on the size and scale of effort of the Manhattan District during World War II. "It would be disastrous," Lawrence said, "if the Soviets produced a hydrogen bomb before the U.S."

Lawrence told his luncheon companions that the U.S. should begin immediately to stockpile critical materials needed in the hydrogen bomb. He presented plans for a vast neutron-production expansion program that could be put into operation in order to store up critical materials against the day the hydrogen bomb was a success. Lawrence told McMahon he was ready to go to Canada to persuade the Canadians to convert their Chalk River reactor to the production of critical materials.

Said Lawrence, in a cry that later became famous among the advocates of the hydrogen bomb and the expansion program: "I want to see a gram of neutrons a day."

At this lunch, McMahon, Hinshaw, and Borden became aware for the first time of the stature of Dr. Edward Teller in the field of thermonuclear research.

Lawrence assured the Committee that, in spite of what other scientists would say against it, the hydrogen bomb was an attainable goal, and Edward Teller was the man who could, and would, drive it through to completion.

McMahon told Lawrence he would come to Berkeley within ten days to discuss plans. Said he: "We hope you can get something going." McMahon told the scientists that if anything held them up, they were to be sure to call him.

That afternoon, Alvarez and Lawrence went back to the Atomic Energy Commission to keep an appointment with the Chairman, David Lilienthal. The physicists were stunned by his attitude. Lilienthal did not appear to want to discuss the program. He turned his back on the scientists and stared out the window. Within a few minutes, unable to make any headway, Lawrence and Alvarez left the room.

In New York the following day, Lawrence and Alvarez found they were unable to get seats on a plane to Ottawa.

Meantime, they called physicist I. I. Rabi at Columbia and arranged an appointment to discuss the superbomb with him. Rabi was worried about the Soviet advances in the field of atomic weapons. When he discovered Lawrence and Alvarez were intent on starting a thermonuclear program, he said: "It is certainly good to see the first team back in. You fellows have been playing with your cyclotron and nuclei for four years, and it is certainly time you got back to work, and I'm awfully happy to see you back in the business." Lawrence went on alone to Ottawa next day.

Several days later, Alvarez and Lawrence arrived back on the West Coast completing their whirlwind trip with the feeling the Canadians would be co-operative. They did not stop to rest. They immediately called a conference to discuss possible locations for the heavy-water reactors. Lawrence Hafstad, head of the Reactors Division of the Atomic Energy Commission, came from Washington to lend advice. Dr. Robert Christie, a physicist from California Institute of Technology who did the theoretical design work on the Nagasaki bomb (called the "Christie Gadget"), and Dr. David Griggs, a geophysicist from the University of California at Los Angeles, also attended the meeting.

The group actually went so far as to select a site for the new heavy-water reactors, on the oceanside (to take advantage of sea water for cooling), at Suisun Bay north of San Francisco and south of Tomales Bay. After a check with Walter Zinn, reactor expert and head of the AEC's Argonne Laboratory, the group decided to base the design along the lines of the Chalk River Canadian reactor. A definite site was chosen on the north stem of the San Francisco Bay, east of Benicia, California, facing on Suisun Bay, and AEC experts from Washington were sent out to inspect it.

Meantime, Lawrence formally appointed Alvarez to head up the proposed Suisun laboratory and pile. Eagerly anticipating going to work on the program, Alvarez cleared out his desk in the Linear Accelerator building at Berkeley and moved

his files into a new building. Physicist Robert Serber was selected to be the chief theoretical adviser on the project. At night Alvarez began studying reports in order to relearn elementary pile theory.

Meantime at Los Alamos, Teller found it difficult to keep his shirt where Oppenheimer had suggested. "I was quite prepared to contribute mostly in the direction of the fission weapons. When I returned from this short trip abroad and was very much disturbed about the Russian bomb, I was looking around for ways in which we could . . . speed up our work. . . . Only after several weeks of discussion did I come to the conclusion that no matter what the odds seemed to be, we must at this time—I, at least—must at this time put my full attention to the thermonuclear program. I also felt this was much too big an undertaking and I was just very scared of it. I was looking around for some of the old crew to come out and participate in this work."

Teller thought of Hans Bethe, who in the Los Alamos days had become a close friend. He went to Ithaca, New York, where Bethe was head of the Physics Department at Cornell University, and after a "somewhat strenuous discussion," Teller believed he had enlisted the eminent scientist. In the middle of the discussion Oppenheimer called and invited the two physicists down to Princeton to discuss the hydrogen bomb. They called at his office at the Institute for Advanced Study.

When they walked in, Oppenheimer picked up a letter from his desk. It was from Dr. Conant, a fellow member of the GAC and President of Harvard University. The letter said, as Teller recalls it, that such a weapon would be built "over my dead body." (Later Conant became famous for saying that, if necessary, he would "stump the country" against building the H-bomb.)

Oppenheimer did not speak out specifically against the H-bomb while Teller was present. But he recalled the anonymity,

the secrecy, and the unpleasantness of the wartime days at Los Alamos.

Before the two scientists had entered Oppenheimer's office, Teller had said: "We are going to talk to Oppenheimer now, and after that you will not come."

When they departed, Bethe turned to Teller and smiled: "You see you can be quite satisfied. I am still coming." They had even discussed Bethe's salary.

Learning that Teller was attempting to enlist Bethe for the thermonuclear program, AEC Commissioner Strauss also talked with him. Bethe explained to Strauss that he was troubled by Teller's offer, since he had already spent long years on the unremunerative government payroll. A return to Los Alamos would be extremely costly to Bethe at a time when his family responsibilities were heavy. Strauss well understood the problem since he had seen many men penalized financially by government service and was prepared to agree that Bethe had already done more than his share of sacrificing. A man of independent means, Strauss asked if Bethe would permit him to pay the difference between his government salary at Los Alamos and his salary as a department head at Cornell University. Bethe seemed moved by the offer.

For the Joint Congressional Committee back in Washington, the enthusiasm and concrete proposals that Lawrence and Alvarez presented came in sharp contrast to the evasive testimony that had been heard from AEC and Defense officials during secret sessions in early October. Try as he might, McMahon had been unable to elicit any discernible enthusiasm for the program either from the Oppenheimer-dominated AEC or from the Department of Defense. The military continued to profess confused skepticism about "Joe One," and seemed only vaguely aware of the meaning of the hydrogen bomb.

Late in the afternoon after the Lawrence lunch, Brien McMahon closeted himself in his office with Borden and drafted a one-page letter to AEC Chairman David Lilienthal.

The letter stated simply that the U.S. could not afford to stand idly aside and risk the chance that the Soviets were pushing toward the development of an H-bomb. McMahon urged that the Commission embark the U.S. on a "crash" program to build the hydrogen bomb immediately.

The following day McMahon appointed a special subcommittee of the Joint Committee and charged it with the responsibility for making a study of the H-bomb program. The members of the subcommittee were: Representative Henry M. (Scoop) Jackson, an advocate of preparedness; Carl Hinshaw; Chet Holifield; and Melvin Price. McMahon's own staff assistant Bill Borden was assigned to provide advice and assistance to the subcommittee. The subcommittee set out immediately for Los Alamos.

Having in the meantime received no word from Lilienthal in answer to his letter urging a "crash" H-bomb program, McMahon went to the White House. When he raised the question of proceeding with a crash program, President Truman was evasive and replied that the matter had not yet come across his desk for consideration.

McMahon went back to his office and composed a letter to Truman. If the President decided against the hydrogen bomb, would he please notify McMahon before making the decision known? McMahon wanted one last try at changing Harry Truman's mind. Several days later, Truman replied, agreeing to notify McMahon first if he ruled against the hydrogen-bomb program.

The special H-bomb subcommittee meantime had arrived at Los Alamos and conferred with the Director of the Weapons Laboratory, Dr. Bradbury. At this time, Bradbury seemed to be in favor of the hydrogen-bomb program. He gave what one Congressman later described as "a wonderful briefing." Bradbury told the subcommittee that a meeting was scheduled for November 7, the following week, that would convene all the leading physicists of the country at the laboratory for a

full-dress discussion on the best way of proceeding with the hydrogen bomb.

Los Alamos was so convincing in its arguments for the H-bomb that after only two days there, Borden and Jackson called McMahon on the telephone to report that the subcommittee was in full agreement. Jackson urged that McMahon call a special meeting of the full Joint Committee in order that a unanimous declaration in favor of the program could be secured and presented to the President. McMahon readily agreed and suggested that the meeting be convened in Chicago.

The advocates of the H-bomb were in motion. And, it developed, so were the opponents.

Teller's suspicions about Oppenheimer's opposition were not unfounded. To Harvard's President and fellow GAC member James B. Conant, Oppenheimer wrote a letter at this very time. It may prove to be one of the few examples on record of Oppenheimer unguarded. It is a remarkable document:

Dear Uncle Jim,

We are exploring the possibilities for our talk with the President on October 30. . . . On the technical side, as far as I can tell, the super is not very different from what it was when we first spoke of it more than seven years ago: a weapon of unknown design, cost, deliverability, and military value. But a very great change has taken place in the climate of opinion. On the one hand, two experienced promoters have been at work, i.e., Ernest Lawrence and Edward Teller. The project has long been dear to Teller's heart, and Ernest has convinced himself that we must learn from Operation Joe ["Joe One"] that the Russians will soon do the super, and that we had better beat them to it.

On the technical side, he proposes to get some neutron-producing heavy-water reactors built and to this, for a variety of reasons, I think we must say amen. . . . But the real development has not been of a technical nature. Ernest spoke to Knowland [the Senator from California] and McMahon and to some, at least, of

the joint chiefs. The Joint Congressional Committee, having tried something tangible to chew on ever since September 23, has at last found its answer. We must have a super, and we must have it fast. A subcommittee is heading west to investigate this problem at Los Alamos, and in Berkeley. The joint chiefs appear informally to have decided to give the development of the super overriding priority, though no formal request has come through. The climate of opinion among the competent physicists also shows signs of shifting. Bethe, for instance, is seriously considering return on a fulltime basis; and so surely are some others. I have had long talks with Bradbury and Manley, and with Von Neumann, Bethe, Teller, MacCormack, and LeBaron, all are scheduled to turn up within the next thirty-six hours. I have agreed that if there is a conference on the super program at Los Alamos, I will make it my business to attend.

What concerns me is really not the technical problem. I am not sure the miserable thing will work, nor that it can be gotten to a target except by oxcart. It seems likely to me even further to worsen the unbalance of our war plans. What does worry me is that this thing appears to have caught the imagination, both of the Congressional and military people, as the answer to the problem posed by the Russians' advance. *It would be folly to oppose the exploration of this weapon.** We have always known it had to be done; and it does have to be done, though it appears to be singularly proof against any form of experimental approach. But that we become committed to it as the way to save the country and the peace appears to me full of dangers.

We will be faced with all this at our meeting; and anything we do or do not say to the President will have to take it into consideration. I shall feel far more secure if you have had an opportunity to think about it.

* Italics are the Authors'.

Chapter 7

WE ALL HOPE

THE OCTOBER 5 memorandum Lewis Strauss addressed to Lilienthal contained the request that the AEC's General Advisory Committee rule on the question of the superbomb in its late October meeting.

Strauss was determined to fight for a quick AEC decision. Before he enlisted the aid of Brien McMahon, Hickenlooper, and the Joint Committee, Strauss first wanted the AEC position clearly stated.

The Chairman of the General Advisory Committee, Dr. J. Robert Oppenheimer, convened the Committee, as requested, on October 29, 1949, at the marble-façade headquarters of the AEC, 1901 Constitution Avenue, Washington, D.C.

Eight of the nine members of the GAC gathered for the meeting. The one absent member, Dr. Glenn T. Seaborg, a chemist from the University of California, was away in Europe. Before he left the U.S., Seaborg addressed a letter to GAC Chairman Oppenheimer supporting the superbomb. Its existence was not disclosed to the other scientists on the GAC or to the members of the Atomic Energy Commission.

Seaborg wrote:

Although I deplore the prospects of our country putting a tremendous effort into this, I must confess that I have been unable to come to the conclusion that we should not. Some people are

thinking of a time scale of the order of three to five years which may, of course, be practically impossible and would surely involve an effort of greater magnitude than that of the Manhattan project. My present feeling would perhaps best be summarized by saying that I would have to hear some good arguments before I could take on sufficient courage to recommend not going toward such a program.

The other members of GAC were:

- 1) J. Robert Oppenheimer, Chairman.
- 2) James B. Conant, President of Harvard.
- 3) Lee A. DuBridge, President of the California Institute of Technology.
- 4) Enrico Fermi, University of Chicago Institute for Nuclear Studies.
- 5) I. I. Rabi, a physicist from Columbia University.
- 6) Hartley Rowe, Vice-President and Chief Engineer, United Fruit Company.
- 7) Oliver E. Buckley, President of Bell Telephone Laboratories.
- 8) Cyril S. Smith, Director, Institute for Study of Metals, University of Chicago.

The General Advisory Committee session lasted one full day. *The Committee concluded that the U.S. ought not to proceed with a large-scale hydrogen-bomb program such as that advocated by Strauss, McMahon, Lawrence, and Teller.* Dr. Oppenheimer expressed the opinion in writing that "the superbomb should never be produced." The minutes of the historic meeting are secret and will probably remain so indefinitely for security reasons. However, from various unclassified sources, it is possible to present the arguments that the Committee brought against the crash hydrogen-bomb program. They were as follows:

- 1) The hydrogen bomb is immoral. Some members of the Committee, and the Committee Chairman, argued that the hydrogen bomb was an instrument of tremendous mass de-

struction, and that no civilized country should consider its possible development and use.

2) The hydrogen bomb is too expensive. The Committee noted the necessity for using tritium as an agent, and pointed out that tritium was excessively expensive in terms of neutron production, and had a short half-life. In order to produce sufficient tritium for the H-bomb, many ordinary plutonium or atomic bombs would have to be sacrificed. The Committee also argued that such a crash program would mean shifting laboratory facilities and personnel from the atomic-weapons program.

3) The hydrogen bomb might not prove feasible. The Committee raised the point that while it believed the hydrogen bomb might be built in five years or so, some physicists had suggested that the atomic trigger "might not hold together" long enough to produce temperatures high enough to ignite a tritium-deuterium mixture. Assuming some uncertainty about the success of a thermonuclear bomb, the Committee argued the U.S. would be leaving a position of certain strength for a position of uncertain strength if it sacrificed proven atomic bombs to an unsuccessful H-bomb.

4) The hydrogen bomb is excessively destructive. The Committee argued that the atomic bombs in the U.S. stockpile were adequate to deal with any target in Russia. The Committee argued that only two targets in Russia were "worthy" of an H-bomb: Moscow and Leningrad. Either, or both, could be systematically destroyed by atomic bombs, the Committee stated. Use of hydrogen bombs would lead to overdestruction or overbombing of foreign targets. Much of the H-bomb blast would be harmlessly dissipated in thin air.

5) There exists no peacetime use for the hydrogen bomb. The Committee argued that a controlled fusion reaction was not possible, while a controlled fission reaction adaptable to peacetime use was possible. The Committee suggested that if the U.S. was serious about trying to achieve international control and the use of the atom for the good of mankind, the

U.S. stockpile ought to be made up of materials adaptable for peacetime use. The Committee urged a public announcement to the effect that there were no peacetime uses for the thermonuclear reaction.

Concluded the GAC report:

We all hope that by one means or another, the development of these weapons can be avoided. We are all reluctant to see the United States take the initiative in precipitating this development. We are all agreed that it would be wrong at the present moment to commit ourselves to all-out efforts towards its development.

During the course of the one-day meeting, the General Advisory Committee invited the Chairman of the Joint Chiefs of Staff, General Omar Nelson Bradley, to present the military case for the hydrogen bomb. Like most people in the Defense Department, Bradley had only vague conceptions of the hydrogen bomb and its possible military use against an enemy. He argued basically that the U.S. could not afford to be less well armed than its potential enemies. His arguments were sound, but he was not able to back them up with facts and figures or technical arguments. The brilliance and intensity of Oppenheimer and his associates overwhelmed "old school-master" Bradley. The military's case for the H-bomb was thoroughly drubbed.

Had Bradley been equipped either in talent or reputation to meet Oppenheimer in debate he might have destroyed the GAC arguments just as effectively on that occasion as events have since.*

* Speaking before the Institute of Industrial and Legal Problems of Atomic Energy, June 28, 1952, Democratic Representative Henry M. Jackson, a member of the Joint Atomic Committee, said: "In late 1949, when there was a controversy on the question of whether or not we should really try to build the hydrogen weapon, a very influential group of experts argued against this step. First they said it would be immoral. Then they said, even if making it in self-defense were moral, it could not be built. Then they said, even if it could be built, it could not be delivered. Then they said, even if it could be delivered, it would cost too much. Then they said, even if it would not cost too much, it could do nothing that A-bombs couldn't do."

Bradley failed to point out that while the morality of the H-bomb was not specifically a question for the scientists, their views as lay opinion certainly were admissible. Or that the GAC argument missed altogether the morality of permitting a totalitarian state, which denies moral law, to develop exclusively a weapon capable of the destruction of the free world. Points two and three were areas in which the GAC scientists should have given competent advice, and Bradley was in no position to refute the GAC case. Yet it is extraordinary that the scientists could have been so wrong. No "conventional" bombs have been lost to tritium production, and the entire concept on which this argument was based was proven obsolete. The thermonuclear principle did prove feasible on the first and all subsequent tries, just as Teller predicted.

The GAC point four was clearly a question more of military judgment than of scientific opinion. The GAC completely overlooked the tactical potentials of the thermonuclear weapon and its immense superiority over the conventional atomic bomb on the battlefield. Moreover, the limit of "blow-out" may not be reached except by the super-thermonuclear giants, equivalent to more than fifty million tons of TNT. For the destruction of a city like New York or Moscow, for example, one airplane with one thermonuclear bomb will do what otherwise would require scores of bombers and scores of conventional atomic bombs.

The GAC's point five regarding peacetime uses of the bomb was in conflict with the 1945 findings of the Final Conferences on the Super, which noted possible peacetime uses.* Moreover, recent physical discoveries suggest that it, too, was scientifically in error.

The decision of the GAC members present was unanimously against proceeding with the H-bomb. However, two of the Committee members, Fermi and Rabi, qualified their votes in a minority report. They suggested that the U.S. try once more

* Later McMahon made a special point of challenging this portion of the GAC report.

to get the Russians to agree to a positive system of international control of atomic and superatomic weapons. Only if unsuccessful in this last try, Fermi and Rabi said, should the U.S. proceed with the construction of the hydrogen bomb.

The fact that no limits exist to the destructiveness of this weapon [Fermi and Rabi wrote] makes its very existence and the knowledge of its construction a danger to humanity as a whole. It is necessarily an evil thing, considered in any light. For these reasons, we believe it important for the President of the United States to tell the American public and the world that we think it is wrong on fundamental ethical principles to initiate the development of such a weapon.

Much later, Dr. Oppenheimer explained the thought processes that led the GAC members to these kinds of conclusions. "The notion that the thermonuclear arms race was something that was in the interests of this country to avoid if it could was very clear to us in 1949. We may have been wrong. We thought it was something to avoid even if we could jump the gun by a couple of years, or even if we could outproduce the enemy, because we were infinitely more vulnerable and infinitely less likely to initiate the use of these weapons. I think that what was not clear to me then, and what is clearer to me now, is that it probably lay wholly beyond our power to prevent the Russians somehow from getting on with it. . . ."

This line of reasoning of the GAC took place after the violation of the Yalta agreements on the Balkans and on Poland, after the rape of Czechoslovakia and the attempted rape of Greece. They occurred after the Soviets had rejected repeatedly the U.S. offer to share its knowledge of atomic power with the world and control it for peaceful uses.

At the time of the GAC report, Lewis Strauss was alone in the top echelons of the Atomic Energy Commission in recommending the hydrogen-bomb program. There since have been long and heated disputes about the exact positions of the

various members of the Commission and the General Advisory Committee. This is understandable since the potential consequences of not building the thermonuclear weapon have since become obviously enormous. Great significance has been attached to the adjective "crash." In the recollections of some of these men it was only a "crash" program that they opposed, though it is now painfully evident that such developments are achieved in no other way.

Others lay great stress on the fact there was no "formal" voting on the question. The various and sundry opinions were simply swept up eventually into catchall majority and minority reports and sent to the President. After all, it is argued in retrospect, the decision was his alone and the atomic commissioners could only lay out the pros and cons for his guidance. (Had Harry Truman been a less tolerant man, he would have been entirely justified in sending the whole bundle of views back to the AEC with the request that a clear recommendation come forward.)

While Strauss and McMahon had expected to lose the showdown, they hadn't expected the vote to be so heavily against them. When they learned of it, they literally were stunned. McMahon communicated word to Teller, saying: "Edward, I have a terrible report from the General Advisory Committee."

McMahon urged Teller to fly east immediately to help the proponents of the hydrogen bomb meet the statistically powerful technical arguments of the nearly unanimous GAC. Teller agreed and hurried to Albuquerque to take a plane east. He went via Chicago, stopped briefly to try to persuade his old friend GAC member Fermi to support the H-bomb. Fermi was cool, refused to tell Teller of the contents of the GAC report. While he was in Fermi's office, Dr. John Manley, Associate Director of Los Alamos (and as such, Teller's boss) and Secretary of the GAC, telephoned him. Manley was in Washington.

He insisted that Teller drop his plan to see McMahon.

Teller asked his reason, and Manley replied that it was important that the scientists maintain a united front against the H-bomb. It would be unfortunate, Manley argued, if the powerful Senate Chairman got the impression there was a division of opinion among the scientists. He insisted that Teller should not come to Washington.

"I am willing to call Senator McMahon," said Teller, "and tell him that I have been asked not to see him and for that reason I would not see him."

"All right," snapped Manley, "you better go and see him."

But when Teller arrived at Washington's Union Station, Manley met him at the train. "I think you sold me a gold brick," Teller recalls that Manley told him. Unfamiliar with U.S. slang, the Hungarian-born physicist had to inquire the meaning of the term before he realized that Manley was attacking the validity of his concept of a thermonuclear bomb. At Los Alamos, Teller had had Manley persuaded.

On their way to downtown Washington, Manley told Teller the General Advisory Committee had a much better answer to "Joe One" than Teller's hydrogen bomb. He refused to say what it was. Teller was mystified.

Teller refused to be turned aside by Manley's pressure. He went later in the day to McMahon's office in the Senate wing of the main Capitol Building. "He did not tell me what was in the report of the GAC, but he used some very strong words in connection with it," Teller recalled later.

McMahon decided to go immediately to Los Alamos to talk with Director Bradbury, whom his subcommittee members had earlier reported as favoring the H-bomb. News of the GAC report preceded him to the laboratory. When he arrived, he learned that Bradbury was now far from enthusiastic about the thermonuclear program. The scheduled meeting of the nation's top scientists to discuss ways and means for going ahead had been canceled.

The top scientists were dropping the H-bomb as though it was a piece of live hardware ready to explode. Rabi, who a

few weeks earlier had expressed enthusiasm to Lawrence and Alvarez, had already voted with Oppenheimer and against the bomb in the GAC. At almost the same time, Teller had occasion to call Hans Bethe in New York. He had last seen Bethe outside Oppenheimer's office in Princeton, where Bethe had smilingly reassured him of his decision to come to Los Alamos. Bethe had changed his mind. He would not come.

At Berkeley, Lawrence learned from Alvarez that Dr. Serber, who had been selected as their chief theoretical adviser and who had gone to Princeton to convert Oppenheimer, was himself converted. A blank wall had been erected against the H-bomb. Lawrence and Alvarez canceled their elaborate plans for a heavy-water reactor at Suisun Bay.

Chapter 8

COUNTERATTACK

THE VOTE OF THE General Advisory Committee and the Atomic Energy Commission did not end the contest. Lewis Strauss, the traditional dissenter, turned to his traditional ally, the Department of Defense. An old friend from the Forrestal days, Assistant Secretary of Defense Marx Leva, arranged a meeting between Strauss and Secretary of Defense Louis Johnson.

Eager to get to the point, Strauss said abruptly as he entered Johnson's office: "Mr. Secretary, isn't it an American tradition that we will never accept the idea that we will be less armed than our enemies?"

Johnson, a former American Legion Commander, agreed. Strauss continued: "The AEC has just voted to reverse that tradition."

The discussion began in late afternoon, and the two men sat in the Secretary's office until after nightfall, when the Pentagon was virtually deserted. Strauss was not able completely to convince Johnson that the Soviet explosion, "Joe One," was an actual bomb, but he was able to get Johnson to agree that the U.S. could not wisely believe otherwise. Strauss pointed out that two months had passed since "Joe One," and the U.S. had done nothing. Finally, Strauss made Johnson see the need for proceeding with an all-out hydrogen-bomb program.

Next morning, Johnson called in the Undersecretary of Defense, the late Steve Early; General Omar Bradley, who only a few days earlier had attended the General Advisory Committee meeting; Major General James Burns, special adviser; and Robert LeBaron, Chairman of the Military Liaison Committee with the AEC.

After the group had gathered in his pale-blue, third-floor Pentagon office, Johnson announced dramatically that there was every reason to believe that the Russians were building an H-bomb, that the U.S. was being sold down the river, and that the U.S. *must proceed with an H-bomb program*. Undersecretary Early readily agreed. One officer in the room said he was not convinced that the H-bomb was practical. "The Air Force already has a bomb powerful enough to blow Moscow off the map. Why waste money on the H-bomb?"

Major General Burns replied quietly: "It's a fundamental law of defense that you always have to use the most powerful weapons you can produce."

Johnson next talked privately with the late Dr. Karl Compton, Chairman of the Defense Department Research and Development Board. He explained that the biggest obstacle to the H-bomb program seemed to be the wall of opposition created by the scientists. Dr. Compton said he was sure that he could find several high-ranking atomic scientists who would testify that the H-bomb was a practical project.

In order to get the Defense Department view clearly and emphatically on the record, Louis Johnson told his special assistant for atomic matters, Robert LeBaron, to prepare an evaluation of the H-bomb as a potential weapon. The report concluded that the bomb was definitely needed for use against certain specific targets, including those on the battlefield. The paper strongly urged an all-out crash H-bomb program, such as Lawrence, Strauss, McMahon, and Teller advocated.

Meantime, Strauss had been talking with AEC Commissioner Gordon Dean. So had Brien McMahon, Dean's former

law partner. Gradually, Dean, the newest Commission member, began to question the reasons for his own opposition.

Dean went to his friend, Supreme Court Justice Robert H. Jackson. The troubled Commissioner asked: "Should we tell the Russians we are prepared to make an H-bomb unless they agree to international control of atomic weapons?"

Jackson, who had dealt with the Russians at the War Crimes trials in Nuremberg, advised Dean to put little faith in Soviet promises. He must be guided solely by what was best for America's defenses, Jackson said.

Eventually, President Truman could no longer avoid facing the H-bomb issue. Brien McMahon and Louis Johnson were bringing hard pressure to bear from two quarters. His special atomic adviser, Robert Oppenheimer, was exerting opposing pressure. Truman called the Atomic Energy Commission to the White House and polled the members. The President then said he would like their views in writing.

On November 9, a single over-all letter was sent from the five Commissioners to the President. With it was enclosed a copy of the General Advisory Committee report, signed by J. Robert Oppenheimer, Chairman. In the over-all letter, the positions of each one of the five members of the Commission was delineated. Attached to this letter were the individual statements of three of the five Commissioners—Lilienthal, Smyth, and Dean—expanding on the one paragraph summaries of their position in the main letter.

The positions of the Commissioners on November 9 were as follows: Lilienthal and Pike were definitely opposed to the H-bomb program. Smyth straddled the fence. He thought the U.S. should delay any decision on the H-bomb until it had made another quick try at reaching some kind of agreement with the Russians. Failing that—and Smyth urged that the try be made quickly and negotiations not allowed to drag—then the U.S. should decide whether to go ahead and make the H-bomb. Gordon Dean, now almost a complete convert to the Lawrence-Strauss-McMahon-Teller viewpoint, urged

that the U.S. initiate a "crash" H-bomb program (but he also said that the government should try to arrive at some kind of agreement with the Russians).

Strauss and Pike were both away from Washington on November 9, and consequently each wrote the President separately later that month, expanding on their one-paragraph views in the letter to Truman. Pike's letter was written November 30, and it followed closely the anti-H-bomb position set forth by Commission Chairman Lilienthal.

Strauss's views were:

Whether it wishes or not, the U.S. must stay in front in the arms race until there is practical world security. Because it saps our strength, the most dangerous idea is to believe our enemies will retire from the arms race, if we do.

We cannot expect the USSR to be persuaded by, or even give considerations to, moral arguments against creating an H-bomb.

The Russians, from our best intelligence, are capable of making a hydrogen bomb; they have the scientists and the equipment. We cannot afford to be less armed than they.

The Commission in its November 9 communication to the President stood three (Lilienthal, Pike, Smyth*) to two (Strauss, Dean) *against* proceeding with the super.

The split decision troubled Harry Truman. He felt "more study" was needed. Accordingly, on November 19, he appointed a special three-man subcommittee of the National Security Council and asked it to study and make recommendations on H-bomb policy. The members of the subcommittee were Secretary of State Acheson, Secretary of Defense Johnson, and AEC Chairman Lilienthal.

After the series of AEC votes against the H-bomb program, Lewis Strauss was about to give up the fight. Three months had passed since the Russians had proved they could make an A-bomb; two months had gone by since Strauss first urged

* Smyth now believes that the following month, when assured by Secretary of State Dean Acheson that any negotiations with the Russians were futile, he switched and became a proponent of the H-bomb.

the all-out H-bomb program. Nothing had happened. Strauss assumed he was all but beaten.

He made up his mind to resign from the Commission.* When Pentagon ally Louis Johnson heard that he intended to leave the AEC, he went to Harry Truman to ask if he could appoint Strauss Secretary of the Navy. Truman, who had not heard of Strauss's intention to leave, categorically refused. He would not consider Strauss's resignation from the AEC. Truman called Strauss "indispensable."

Strauss was frankly concerned over the fact that so many people disagreed with his views on the H-bomb program. He began to think his own judgment might be faulty. On this all-important question, he was practically alone. He felt that if his judgment was wrong on this—and he had been outvoted every time—it was also probably wrong on other matters.

Just before Christmas, 1949, Lewis Strauss, deeply depressed, disappeared from sight in Washington and went to the Beverly Hills Hotel, in Beverly Hills, California, to be by himself and think. He picked this unlikely spot for his Gethsemane because his mother-in-law had offered him a cottage that she maintained there. Quietly and silently, Lewis Strauss began a careful and sweeping reappraisal of his own ideas.

On the fifth day the telephone rang. It was Brien McMahon. Strauss remarked on the loudness and clarity of his voice and wondered where he was calling from. "I'm calling from the lobby, and I want to see you and tell you that you are right," said McMahon. When the two men met face to face, Strauss told McMahon that he had reached the same conclusion. That night, Strauss headed back to Washington, and the Atomic Energy Commission on Constitution Avenue, for one more try at pushing the H-bomb program through.

McMahon had been staying at the Beverly Hills Hotel, and

* Lilienthal for different reasons had reached a similar conclusion and had actually submitted his resignation to the President, who persuaded him to stay on in his job until the final decision on the H-bomb had been made.

with staff director Bill Borden's help, he composed a five-thousand-word letter to President Truman. In this letter, McMahon stated that the U.S. could no longer allow the decision on whether to build the hydrogen bomb to drag on. McMahon recounted all the arguments against the program, demolishing each one. He wrote that the very survival of the United States might well depend upon the speed with which the hydrogen bomb was achieved. McMahon told Truman that there was no lack of targets in the Soviet Union, that airfields of the Russian Strategic Air Command could best be destroyed by the superbombs.

McMahon sent the letter to Washington via Bill Borden. McMahon advised the President to study the letter carefully and to reach a decision on the H-bomb as quickly as possible because valuable time was being lost. McMahon told Truman that the Joint Congressional Committee was unanimously in favor of proceeding with a crash project, and that there would be serious consequences if Truman ruled against the program.

The Connecticut Senator pictured the dread threat to the free world if Soviet Russia won the race for the H-bomb. He wrote: "Put total power in the hands of total evil, and you can only get total destruction."

Chapter 9

THE PRESIDENT DECIDES

SEVERAL MORE WEEKS of indecision passed. Then Washington received a piece of news that struck with greater force than the word of "Joe One." On January 27, 1950, Dr. Emil Julius Klaus Fuchs, formerly group leader at Los Alamos Atomic Weapons Laboratory, and then head of the Theoretical Physics Division at the main British atomic energy establishment at Harwell, confessed to British Agent William James Skardon that he had engaged in espionage, including the passing of atomic secrets to the Soviet Union, through the period 1942 to 1949.

As a small circle of official Washington shuddered at this news, the General Advisory Committee was ordered to meet in Washington on January 30, to ascertain, as nearly as possible, how much information Fuchs could have given to the Soviet Union. By the end of the meeting it was clear that Fuchs had been in a position to be of enormous aid to the Russians. He was intimately acquainted with the techniques of making atomic bombs. He had knowledge of "improved" atomic bombs. He had worked on the manufacturing processes at the gaseous-diffusion isotope-separation plant at Oak Ridge. He knew the U.S. position with respect to the hydrogen bomb as it existed in June, 1946, because he had not only attended

the Los Alamos seminars but had been a leading participant.

When the GAC submitted its report, the President called Secretary of Defense Louis Johnson and asked him to convene the special H-bomb subcommittee of the National Security Council the following day. Truman wanted a decision at once on the U.S.'s own H-bomb program.

The committee met the following morning, January 31, in a conference room on the second floor of the old War-Navy-State building, across from the White House. The conference room was large and bare, painted a dingy brownish yellow to hide dirt. This was the first time the committee had ever convened.

In the middle of the room stood a long conference table. A dozen men—the members and their aides—took seats around it: Louis Johnson, with his atomic assistant, Robert LeBaron; Lilienthal, who brought along Commissioner Henry Smyth and the AEC General Counsel Joseph Volpe; Acheson and his adviser, R. Gordon Arneson; plus Rear Admiral Sidney Souers, the secretary of the National Security Council, and his assistant, James Lay; and others.

Lilienthal sat on the west side of the table, looking toward the dingy wall. Acheson sat across from him, looking at the windows on Seventeenth Street. Louis Johnson was at the north end of the table, on the same side as Acheson. The treachery of Klaus Fuchs dominated and stampeded the discussion.

They voted—Acheson and Johnson together for the H-bomb program; Lilienthal against. Johnson and Acheson each brought drafts of what they thought the President should say. Lilienthal had no draft of anything, except a half-hour speech, which he proceeded to give. He was morally against the H-bomb and kept saying over and over that he had a "visceral feeling this is wrong."

There was little argument—just the impassioned oratory of Lilienthal, and the hard, cold vote—two for, one against. There was a brief discussion over which draft ought to be

used—State's or Defense's. But the group quickly settled on Johnson's because it did not "apologize to the world" for what the U.S. had decided to do. After the meeting broke up, the statement was taken across the street to the White House.

In the White House, President Harry Truman hesitated momentarily. Rear Admiral Souers, who had brought the decision and the draft, spoke quietly to the President: "I don't think you have a choice. It's either we make it or wait until the Russians drop one on us without warning."

That afternoon, Truman announced: "I have directed the AEC to *continue* [a verb selected obviously for its deceptive value] its work on all forms of atomic weapons, including the so-called hydrogen or superbomb. Like all other work in the field of atomic weapons, it is being and will be carried forward on a basis consistent with the over-all objectives of our program for peace and security."

Lewis Strauss was in a meeting of the Atomic Energy Commission when an aide came in to tell of the President's announcement. Strauss was taken completely by surprise.

Brien McMahon was in a meeting of the Joint Committee—one of many called in January to consider the issuance of a unanimous declaration urging that the President proceed with the hydrogen-bomb program—when he heard the news.

Later that same afternoon, after he had freed himself of AEC business, Lewis Strauss went to the White House, congratulated Truman on his decision, and then offered his resignation. His battle had been won. The President at first refused, but Strauss was insistent. Eventually he agreed to stay on until mid-April, until a successor could be found.* It was Lewis Strauss's fifty-fourth birthday.

In the small, clannish world of scientists and physicists, the President's decision was an enormous blow to the prestige of Oppenheimer and his associates, a remarkable victory for the relatively insignificant Lawrence-Teller group. That night at

* Strauss was succeeded by a New York Democrat, Thomas E. Murray, on April 15, 1950.

Los Alamos and Berkeley the victorious scientists—Teller, Lawrence, Latimer, Alvarez—celebrated the victory, but with no illusions. Better than anyone else, they knew that in spite of White House backing, a tough battle lay ahead—and not all of it would be scientific.

That same evening, several thousand miles away in Washington, Lewis Strauss had several guests in his Shoreham Hotel suite to celebrate his birthday. Dr. Oppenheimer was among them. His lean, dramatic face was tense. He approached another guest, and, with a note of unswerving dedication, remarked: "As Woodrow Wilson said, 'A battle is never won or lost.'"

PART TWO

Chapter 10

THE PROBLEM

EDWARD TELLER was unaware that the battle for the hydrogen bomb was reaching a critical phase in Washington. He also assumed the fight had been lost.

Teller learned of President Truman's decision to "continue" with the hydrogen bomb from headlines in the Los Angeles newspapers. He had gone there from Los Alamos to arrange a job on the faculty of the University of California at Los Angeles for the following academic term. When he read the Washington dispatch reporting the momentous decision, he called the University to ask to be relieved of his commitment, and caught the next airplane back to Albuquerque. Flying on to Los Alamos, he rushed to the office of Laboratory Director Norris Bradbury.

Teller expected to receive orders to go ahead at full pace on thermonuclear research. He found Bradbury in no such frame of mind.

The public decision had been made so hastily that no secret directive to the AEC accompanied it. When, a few days later, this directive was prepared, inside the AEC, for the President's signature, it was so worded as to leave doubt whether the President wanted merely a thermonuclear study or a bomb. Not until the directive came to the attention of the Joint Congressional Committee was the strange ambiguity corrected. The Committee demanded—and got—a new Presidential

directive. And even this one—again written in the AEC—was not entirely explicit. It was used a year and a half later by the anti-H-bomb forces to argue against the kind of specific work on hardware that Teller proposed.

Even after he received the second directive, Bradbury continued to counsel caution.

Feeling among many scientists at Los Alamos, Teller discovered, was generally hostile to the H-bomb. The fight in Washington had been long and bitter. Oppenheimer's position, and that of his colleagues on the General Advisory Committee, were well known in Los Alamos. Copies of the GAC report had been widely circulated at the laboratory earlier by direction of AEC General Manager Carroll Wilson, presumably to prepare the scientists for a briefing of McMahon and his Joint Committee members. The implication was that the GAC hoped that the scientists at the weapons laboratory would be successful in persuading McMahon against the hydrogen bomb.

The hostility to the H-bomb at Los Alamos has since been widely debated.* Many hydrogen-bomb advocates blamed the situation on the direct intervention of Robert Oppenheimer, though there is no evidence that he took overt action to persuade the scientists at the weapons laboratory to strike against the President's decision. There seems to be no question that his opposition, as expressed in the GAC report, was sufficient to produce a widespread reaction. Oppenheimer was the most influential figure in U.S. science. He was venerated by the younger physicists in the weapons laboratory. Moreover Bradbury's conservative approach had its effect.

The extent to which Oppenheimer influenced his onetime physics student, Bradbury, is a matter of controversy as yet

* The Los Alamos laboratory did dig out the record of the Final Conference on the Super and republished it to bring its scientists "up to date" on the thermonuclear program. It was dramatic proof that essentially nothing had, in fact, been done about thermonuclear weapons development between June, 1946, and January 31, 1951.

unresolved. It seems clear that Bradbury owed his appointment to Oppenheimer. Moreover, it is clear that as the powerful head of the AEC's General Advisory Committee, Oppenheimer could, in the days of Chairmen Lilienthal and Dean, have caused the removal of a weapons-laboratory director who opposed him. Some members of the Congressional Committee believed that Oppenheimer controlled Bradbury. Said one: "Oppenheimer's influence on Bradbury can hardly be exaggerated."

Whether or not Bradbury was unduly influenced by Oppenheimer, there is strong evidence that he invariably took the cautious approach in atomic research. He wanted no missteps that would damage the reputation of the laboratory. He ran it the way a good naval commander often runs his ship, one eye on the alidade, one on the regulations. Commenting on the cautious and timid post-World War II pace at Los Alamos and throughout the atomic program, Enrico Fermi once snorted: "What we need is a bomb that doesn't go off and a reactor that does."

Los Alamos was necessarily a tightly knit community. If Bradbury was cautious, the main body of the scientists at the weapons laboratory was conservative. The laboratory was a remarkable community, and life there took some getting used to.

The houses were quonset huts, tar-paper covered dormitories, and prefabricated houses, except for the few permanent faculty buildings left behind by the boys' school that predated the atomic lab. Everyone was under the tight discipline of the director and had to obey his orders unquestioningly.

There was no free business enterprise. The Zia (Pueblo Indian for Sun) Contracting Corporation ran Los Alamos on a cost-plus-fixed-fee basis. Operating on a twelve-million-dollar annual budget, it handled the school system, utilities, buildings, bus system, the *Los Alamos Times*, and a radio station KRS, which did not broadcast but simply piped its programs into the town's electric circuits.

The daily ritual of the men of science disappearing each morning into the barbed-wire-enclosed laboratories, leaving their wives, families, security guards and town workers outside, reminded a *Time* magazine correspondent of Aldous Huxley's *Brave New World*. Huxley's social structure was more elaborate but similar, descending from gray-clad Alpha Plus intellectuals (who ruled) to black-clad Epsilon Minus (semimorons).

Far into the postwar period, and long after many Americans were abruptly changing their minds about the nature of Soviet Communism, Los Alamos, remote and preoccupied, preserved a collective state of mind that can only be described as "soft" on this issue. Loaded with Communists and former Communists during the great wartime effort to beat Hitler to the atomic bomb, Los Alamos still had some of them on its rolls after this tolerance had fallen into extreme disfavor in the nation at large.

One remarkable encounter between the laboratory and Lewis Strauss, while he was still a member of the original AEC, left scars that neither side can perhaps easily forget.

An FBI report crossed Strauss's desk alerting the AEC to the fact that a man, who had been a Communist until a few months before his employment at Los Alamos, was then custodian of the top-secret library at the weapons laboratory. He had been employed while Oppenheimer was director of the laboratory and had been certified repeatedly by the laboratory officials as "essential" in connection with wartime draft deferment. At the time of his employment, the report noted, this man who was "essential" to the development of an atomic bomb had been a street-railway motorman. Strauss called for his personnel records to ascertain whether at the time of his employment by the Manhattan District, or later when he had been integrated on the AEC payroll, he had stated his Communist membership. He had not.

The AEC promptly alerted Los Alamos and asked for a complete explanation of his present status and his failure to

acknowledge his Communist membership. The Commission received a well-written letter from the employee explaining that he had a wife and family to support and that on both occasions it was clear that such an acknowledgment would have denied him employment. Later, when the Commission indicated that the employee would have to be fired, it received notification that Dr. Bradbury and his top staff assistants were coming to Washington to discuss the case. Before the Commission, Bradbury and his senior associates strongly opposed such action and assured the Commission that the employee was of the highest loyalty and integrity. The Los Alamos staff members added that they would relieve the atomic Commissioners of responsibility in the matter. Moreover, they added, if the Commission insisted on his dismissal, the senior members of the Los Alamos staff could not be held accountable for the consequences in terms of the work of the weapons laboratory.

The Commissioners were happy to buck the burden of reply to Lewis Strauss. He paused for what seemed then like an eternity, but which he now concludes was about thirty seconds. Then he drew an analogy to the field that he knew best, banking.

"Suppose," he began, "we were the directors of a bank and had discovered that our cashier had once been convicted of embezzlement. When we checked his records, we learned that he had concealed this information from us on all occasions. We asked him about it and he replied that, yes, he had been an embezzler, but that he could not have told us that at the time of his employment because if he had, he would not have gotten the job. He needed the work because he had a wife and family to support.

"Let us suppose, then, that we decided on the dismissal of this cashier and the vice-presidents of the bank came to us in a body to say that they had worked with the cashier for some time and were confident that his embezzling days were at an end. Moreover, they said to us: 'We, the vice-presidents, relieve you of your responsibility as directors. If you go through

with this, we will not be responsible for what happens to this bank.'

"I am sure we would have to reply to our vice-presidents: 'Gentlemen, in the first place, you cannot relieve us of our responsibilities as directors. We, by law, have responsibilities to the stockholders and depositors of this bank to protect their investments and their deposits to the best of our abilities. You cannot relieve us of these responsibilities since your total assets do not even come close to equaling the assets of this bank. If you say you cannot be responsible for the consequences should we fire this cashier, we had better make clear where we stand immediately. You need not return to your desks, gentlemen. Their contents will be carefully packaged and sent to you.'"

When Strauss had finished, the protesting Los Alamos staff officers were dismissed from the AEC conference room. With little further discussion, the Commissioners voted unanimously to dismiss the top-secret librarian who had concealed his Communist membership. Bradbury and Company returned to Los Alamos. There were no resignations from the senior staff.

Teller's enthusiasm to get on with the White-House-ordered hydrogen-bomb program was quickly dampened. The scientific and engineering problems that confronted him, if Truman's orders were to be carried out, remained enormous.

The target of the wartime Los Alamos group had been the development of a weapon that would release some of the energy bound into the nucleus of the heavy element uranium. When the atomic program began, scientists regarded two isotopes of uranium, uranium 233 and uranium 235, and the man-made element plutonium as "fissionable." The term was misused, but it meant, in this case, that the big nuclei of these uranium isotopes could be broken up if struck by a fast-moving neutron. If enough "fissionable" uranium was assembled together in a "critical" mass, it would sustain a "chain reaction," creating more neutrons as the process developed, and would explode with tremendous force.

This process has been described by the *New York Times's* scientific correspondent William L. Laurence as the "spontaneous combustion" of the atomic nuclei. This "spontaneous combustion" was only the beginning, though an essential beginning, to the art of extracting the enormous quantities of energy locked up in the atomic nucleus. It was the step on which Director Oppenheimer and his associates at the Manhattan Laboratory at Los Alamos concentrated during World War II.

Another step was already well known in theory to the scientists of the Manhattan District. From the lightest element, hydrogen, to the center of the atomic scale, energy can be released in the fusion of two nuclei to form a new nucleus further down the atomic scale. For example, if two hydrogen nuclei were brought together with sufficient force, they would fuse and form a nucleus of the next element down the scale, helium. The helium nucleus would weigh less than the combined weights of the original hydrogen nuclei and the difference would be released in energy.

There was no known or suspected method of inducing this reaction "spontaneously." It could only be done theoretically by thermal agitation or in one simple word, heat. Just as chemical fires are ignited by heat, nuclear fires could be ignited by heat. The temperatures suggested, however, were enormous, greater in fact than had ever been known on earth.

The "spontaneous" atomic bomb had exploded with a force many thousand times that of one of the more explosive chemicals known to man, TNT. For brief millionths of a second—while it held together—the atomic bomb had produced temperatures then unknown in the solar system.

But in the millionths of a second the atomic bomb produced its great heats, the temperatures would have to rise to at least a hundred million degrees to ignite even the most combustible combination of heavier hydrogen isotopes.

The two atomic bombs the U.S. dropped on Japan at the end of World War II were comparatively crude affairs. They

developed a force equivalent to twenty thousand tons of TNT. Measured in kilotons (one kiloton is equivalent to a thousand tons of TNT), the bombs were twenty kilotons in force. Counting Alamogordo, and the two bombs that were dropped at the Bikini tests in 1946, the U.S. exploded five twenty-kiloton bombs. In 1948, during the "Operation Sandstone" test at Eniwetok, the bombs were improved for the first time. According to a statement of Senator Ed Johnson of Colorado, a member of the Congressional Atomic Committee, the bombs were increased in force to six times the power of the wartime bomb, or to about 120 kilotons.

In the World War II bombs, a critical mass of uranium was created by dividing the necessary amount of the metal into wedge-shaped pieces and driving them together with great force. This was accomplished by fixing charges of chemical explosive (such as TNT) in the firing mechanism so that they would implode the wedges into a common center. The implosion and the heavy metallic tamper around the bomb provided sufficient inertia to hold the bomb together while the chain-reaction developed force. In the postwar bombs, both the firing mechanism and the tampers were improved. Three such bombs were exploded. No further tests were carried out during 1949 or 1950 ("Joe One" was the only nuclear explosion in 1949).

For his thermonuclear project, Edward Teller needed more and more heat for longer and longer periods in the atomic explosions before he would have an effective thermonuclear "trigger," or "match." The wartime bomb generated 50 million degrees for 1.1 millionths of a second. He knew from his study of reaction times that a mixture of hydrogen's two heavier isotopes, deuterium and tritium, in their liquid form, would "ignite" in 1.2 millionths of a second at temperatures of 100 million degrees. The improved atomic bombs brought him within range of a deuterium-tritium "fire" that in turn might "boost" an atomic explosion to the 400-million-degree temperatures that would ignite other possible thermonuclear fuels, more readily available than tritium. One possibility was

liquid deuterium. Thermonuclear weapons made entirely of deuterium-tritium mixtures were virtually out of the question because of the tremendous cost in money and atomic resources of manufacturing tritium. This point had been heavily labored by the AEC's General Advisory Committee.

But each improvement in the fast-neutron bomb was a step toward Teller's goal. He had helped enthusiastically with the theoretical studies of atomic-bomb improvements on his "temporary" return to the weapons laboratory in 1949.

There were still formidable theoretical and mechanical obstacles, however, before the uranium bomb, even as it had been improved by 1948, would be a workable trigger for a useful thermonuclear bomb. No way of engineering a hydrogen bomb had been proposed. How would a deuterium-tritium mixture be arranged around the uranium trigger so that the whole thing did not blow apart before the reaction could proceed?

Tritium is not only extremely difficult and expensive * to manufacture; it could be made only at the sacrifice of fissionable plutonium, since both are produced in the same type of pile. For each gram of tritium, the U.S. would sacrifice eighty grams of plutonium. Tritium, moreover, has a half life of twelve years. That is, every twelve years one half of a given quantity of tritium decomposes by radioactivity.

A bomb made of deuterium and tritium would be no bomb at all but a refrigeration plant. To be preserved in their liquid state, deuterium and tritium must be kept under pressure at more than 400 degrees below zero. This kind of hydrogen "bomb" could not easily be loaded into the bomb bay of an aircraft and flown thousands of miles to an enemy target. Dr. Oppenheimer had pointed out in his letter to Harvard President Conant that the "miserable thing" probably could not be gotten to a target "except by oxcart."

A hydrogen "bomb" would not be the most effective bomb

* One estimate of the cost: a million dollars a pound.

until it could be made of something besides the liquefied gaseous isotopes of hydrogen. A transportable thermonuclear bomb should be "dry."

The first slow work that began on the hydrogen project—some time after Harry Truman thought he had set the machinery in motion to develop this weapon—was a series of calculations designed to determine the minimum amount of tritium needed to boost a fission bomb into a thermonuclear trigger. The results, for which Teller himself takes full responsibility, were disappointing. They showed that an extraordinary, if not a prohibitive, amount of tritium would be necessary.

When the reports reached Washington, the opponents of the thermonuclear program in the AEC seized upon it and gave it wide circulation. It seemed to prove the technical objections of the General Advisory Committee. Teller was in serious trouble. Thousands of man hours of the nation's top scientific talent were needed to break through the barriers of calculation and experiment that lay between Teller and success.

Chapter 11

THE SECOND DELAY

TELLER'S NEXT MOVE was to call again for help. If the thermonuclear program was to succeed, he would need a large-scale return to the laboratory by the men who built the atomic bomb.

At the very heart of the matter was the true nature of scientific discovery.

"A scientific invention," says Teller, who must be acknowledged as an authority on this subject, "consists of six (or some number) of ideas, five of which are absurd but which, with the addition of the sixth and enough rearrangement of the combinations, result in something no one has ever thought of before."

At Los Alamos he felt that the way to solve the formidable technical difficulties of the hydrogen bomb was to work on them. Sooner or later the missing "sixth idea" would emerge. One of Teller's associates elaborates this logic:

"In chemistry they speak of autocatalysis, the phenomenon of one chemical reaction leading automatically into another. The same thing applies in research. A group can start off with what seems to be a lot of goofy ideas, but in the process of working and thinking you get led onto others that are good. All the super needed, and Edward knew that is what it needed, was this climate of autocatalysis."

Teller issued an urgent call through scientific channels. The

response: two top-rank U.S. scientists volunteered. John Wheeler of Princeton University agreed to go to Los Alamos. His colleague, Professor John Von Neumann of the Institute for Advanced Study, agreed to make himself available for consultation. Later Dr. Lothar Wolfgang Nordheim, of the University of North Carolina, signed on at Los Alamos. A student of Bethe's, Dr. Conrad Lee Longmire, also worked on the project along with a student of Teller's, Marshall Rosenbluth.

Bradbury was reluctant to put any of the members of the existing Los Alamos staff at Teller's disposal. He favored a cautious program. Moreover, he could argue with some justification that his scientists already had more than they could do in fission-bomb improvement. Teller needed an army; he had less than a squad.

The "climate of autocatalysis" was entirely missing. Instead, the climate at Los Alamos was at least indifferent, more often hostile.

In Washington, Teller's friends set about to help with the recruiting. The Joint Congressional Committee offered to help the AEC enlist scientists by issuing a statement on the extreme importance of the hydrogen work, addressed to scientists. This offer, acting AEC Chairman Sumner Pike curtly declined after (the Joint Committee was led to believe) he had consulted with GAC Chairman Oppenheimer.

It developed that the majority of the key wartime atomic scientists not only refused to participate in the H-bomb program,* but some actively lobbied against it. In the spring of 1950, shortly after Truman's go-ahead signal, the anti-H-bomb

* In Washington, Congressmen who asked the question of the AEC, who on the Los Alamos staff is working full time on the super, were never able to get an answer. Actually Wheeler took a sabbatical year to work at Los Alamos, returned to Princeton in 1951 to head a special thermonuclear research project. Nordheim remained a year. Von Neumann was in and out of Los Alamos. The roster of theoreticians at the weapons laboratory actually declined during 1950, the year of President Truman's decision to build a hydrogen bomb.

campaign broke out into a brief but intense public debate. While the bomb lay derelict in a musty report in the AEC files, the scientists were content that it remain highly classified.

When it was revived by Truman's order, they insisted on the public's right to all the facts. The tactics varied. Some opponents spoke right out against the H-bomb. Others urged renewed attempts at negotiations with the Russians. Others advocated a stronger defense of the U.S. Others demanded that the U.S. release its atomic secrets. Others pushed for a more active A-bomb program; others sought to frighten the U.S.—and the world—with scare stories about how the H-bomb could wipe out civilization, even life on earth.

The leaders in the anti-H-bomb lobby were the opinion leaders of U.S. science: Einstein, Rabi, Bacher, Conant, Szilard, and others. The effect of their arguments on the younger scientists was massive. They stayed away from Los Alamos in droves.

The kickoff in the public campaign came shortly after the President's announcement on January 31, 1950. At the close of the annual meeting in New York of the American Physical Society, twelve of the nation's leading physicists, including F. Seitz, G. B. Pegram, F. W. Loomis, Hans Bethe, C. C. Lauritsen, and others, issued a statement that said:

We believe that no nation has the right to use such a bomb, no matter how righteous its cause. This bomb is no longer a weapon of war but a means of extermination of whole populations. Its use would be a betrayal of all standards of morality and of Christian civilization itself. . . . To create such an ever-present peril for all the nations of the world is against the vital interests of both Russia and the United States . . . we urge that the United States through its elected government make a solemn declaration that we shall never use this bomb first.

This appeal was followed up by another from Dr. Albert Einstein. In a statement that received world-wide notice, he said:

The idea of achieving military security through national armaments is, at the present state of military technique, a disastrous illusion. . . . The armament race between the U.S.A. and the U.S.S.R. . . . assumes hysterical character. . . . The H-bomb appears on the public horizon as a probably attainable goal. . . . If successful, radioactive poisoning of the atmosphere and hence annihilation of any life on earth has been brought within the range of technical possibilities. . . . In the end there beckons more and more clearly general annihilation.

Oppenheimer did not make public statements against the hydrogen bomb. In fact, only twice did he go on record publicly about the President's decision. In these statements, he challenged the wisdom of the manner in which the decision was made and suggested that more information be given the public. The first comment was made during a radio interview with Mrs. Eleanor Roosevelt. Dr. Oppenheimer said:

The decision to seek or not to seek international control of the A-bomb, the decision to try to make or not to make the H-bomb, are issues, rooted in complex technical matters, that nevertheless touch the very basis of our morality. There is grave danger for us in that these decisions have been taken on the basis of facts held secret. This is not because the men who must contribute to the decisions, or must make them, are lacking in wisdom; it is because wisdom itself cannot flourish, nor even truth be determined, without the give and take of debate or criticism. The relevant facts could be of little help to an enemy; yet they are indispensable for an understanding of questions of policy. If we are wholly guided by fear, we shall fail in this time of crisis. The answer to fear cannot always lie in the dissipation of the causes of fear; sometimes it lies in courage.

Later, before the New York City Bar Association, he said:

We have often learned of decisions taken in this field [atomic energy] in which all that has appeared in public has been a sort of superficial raffle, and it has not been easily possible to conclude as to whether the decisions were wisely or foolishly taken. Let

me give two examples: about a year ago the President said that he was directing the AEC to proceed with the work on all forms of atomic weapons, including the so-called hydrogen or thermonuclear weapon. Neither the procedures, nor the arguments, nor the consequences of this decision are in the public domain. . . .

At about this time, Teller called Oppenheimer on the telephone at Princeton. He told Oppenheimer that he was not asking for his direct help, but for his help in recruiting scientists to work at Los Alamos. Said Oppenheimer: "You know in this matter I am neutral. I would be glad, however, to recommend to you some very good people who are working here at the Institute." He mentioned a few names. Teller wrote each of them a letter, asking them to come to Los Alamos. None came.

Meantime, the public campaign against the H-bomb continued. Four other scientists—Drs. Hans Bethe, Leo Szilard, Frederick Seitz, and Harrison Brown—succeeded in causing a nationwide uproar when, on a Chicago Round Table radio program, discussion took this turn:

MR. BROWN: "We have been discussing thus far the hydrogen bomb in terms of destruction by blast and in terms of delivering over a target. One sees in the press, from time to time, statements concerning destruction by another source—namely, radioactivity. How would you look upon that particular danger? Will dispersal actually help if H-bombs are used not for blast but for radioactivity?"

DR. SZILARD: "In this case [dispersal] will not help at all."

DR. BETHE: "You are certainly right when you emphasize the radioactivity. In the H-bomb, neutrons are produced in large numbers. These neutrons will go into the air; and in the air they will make radioactive carbon fourteen, which is well known to science. This isotope of carbon has a life of five thousand years. So, if H-bombs are exploded in some number, then the air will be poisoned by this carbon fourteen for five thousand years. It may well be that the number of H-bombs will be so large that this will make life impossible."

DR. SZILARD: "Yes, that is true, Bethe. But that is not what I had in mind, because it would take a very large number of bombs before life would be in danger from ordinary H-bombs.

"What I had in mind is this: the H-bomb as it would be made would not cause greater radioactivity than that which is due to the carbon; but it is very easy to rig an H-bomb on purpose, so that it should produce very dangerous radioactivity....

"Let us assume that we make a radioactive element which will live for five years and that we just let it go into the air. During the following years it will gradually settle out and cover the whole earth with dust. I have asked myself: How many neutrons or how much heavy hydrogen do we have to detonate to kill everybody on earth by this particular method? I come up with about fifty tons of neutrons as being plenty to kill everybody, which means about five hundred tons of heavy hydrogen." *

In general, the anti-hydrogen-bomb campaign had a vague objective: some sort of a disarmament agreement with the Soviet Union immediately, some sort of world government eventually. Both, of course, were commendable objectives, much to be preferred to annihilation of life on earth. Unhappily, they led the U.S. closer and closer to the most dangerous diplomatic booby trap of the mid-twentieth century. The Soviets had responded to our earnest efforts to control atomic energy—as outlined by elder statesman Baruch before the U.N.—with one persistent line: The U.S. must sign an agreement to outlaw the atomic weapons.

When the U.S. replied that this was an acceptable objective and raised the question of guarantees to ensure that the

* Szilard's alarmist statements were challenged by Dr. James R. Arnold of the Institute for Nuclear Studies at the University of Chicago. Concludes Arnold, after a highly technical discussion of the cobalt bomb: It is possible . . . the vast majority of the race can be killed off in this way, although a full-scale effort by a major country over many years would be required (i.e., five to ten years, plus an expenditure of about \$40,000,000,000 minimum)....

"agreement" would be honored, the Soviets refused even to discuss it. In the post-World War II period, the Soviets had violated no less than twenty solemn diplomatic agreements. Clearly the danger for the U.S. in this area was overriding. In such a fashion, the U.S. could be stripped naked of its defenses against Soviet power. The free system in which the U.S. existed would have required the U.S. to honor an agreement to abolish atomic weapons. The tyrannical system of the Soviet police state would have guaranteed that the Soviets could ignore the agreement with impunity.

When the anti-H-bomb scientists were not trying to scare the wits out of the U.S. people, they were appealing to their well-developed conscience. In an article printed in *The Scientific American* and later reprinted in the *Bulletin of Atomic Scientists*, Dr. Bethe wrote:

"Can we who have always insisted on morality and human decency between nations as well as inside our own country introduce this weapon of total annihilation into the world?" Dr. Bethe thought not. He said if we wished to fight the Russians, "our methods must be clean." Use of the H-bomb, he said, would be "compared to the warfare of the Genghis Khan who ruthlessly killed every last inhabitant of Persia." *

It remained for Dr. Robert F. Bacher, former scientific member of the Atomic Energy Commission (he was replaced by Dr. Smyth) to attack the hydrogen bomb from the military standpoint. Head of the Physics, Mathematics, and Astronomy Departments at the California Institute of Technology, Bacher, a self-styled military expert, spoke in behalf of the anti-H-bomb scientists at Town Hall, Los Angeles, on March 27, 1950. He said:

Except for the psychological effects and for the most unpleasant and somewhat unpredictable effects of the radioactivity produced, it appears that a hydrogen bomb which is a thousand times more

* AEC security officers actually took over the printing plant where Bethe's article was being published, and at the last minute deleted what were held to be classified statements.

powerful than an atomic bomb might cause more destruction but would probably not be much more effective than ten atomic bombs. . . .

Bacher stated that a large stockpile of atomic bombs would be more than sufficient to deal with a potential aggressor. If the U.S. had a stockpile of a thousand bombs, he said, "the military commanders charged with the responsibility of prosecution of the war would have a hard time figuring out what to do with the last hundred."

From these arguments [Bacher stated] it appears that the hydrogen bombs will not add greatly to the military effectiveness of the United States. . . . Viewed only from the standpoint of its military effectiveness, there seems to be little reason to attach such great significance to the hydrogen bomb. While it is a terrible weapon, its military effectiveness seems to have been grossly overrated in the mind of the layman.

At length, the anti-H-bomb campaign reached such proportions that the AEC in Washington found it necessary to send out an order prohibiting further public discussion of the hydrogen bomb insofar as it could. The AEC order stated:

All AEC and contractor employees working on AEC contracts are instructed to refrain from publicly stating facts or giving comment on any thermonuclear reactions of the Commission's program of thermonuclear weapons development. Please make sure the foregoing instructions are immediately brought to the attention of persons working under contracts with this office and are strictly complied with.

The stern AEC telegram, which applied to many of the top-flight U.S. physicists (since their universities in most cases held some form of AEC contract), suppressed the external anti-H-bomb campaign.* It did not stop the internal anti-H-

* Harry Truman told a White House visitor that he was going to build the H-bomb "behind my own iron curtain."

bomb campaign, nor did it stimulate a rush of volunteer scientists to go to Los Alamos to help Dr. Teller.

A friend recaptures the flavor of the times: "It took guts for Edward to go ahead. You don't fight God, you know, and Einstein was God and Oppie was His only begotten Son. You have to remember, too, that physics is a closed little world where everybody knows everybody else, and that most of these people—Bethe and Szilard and a lot of others—were not simply people whose opinions Edward respected but people who were his personal friends. He had worked with them and lived with them and the families were friends. And Edward is a sensitive guy. He doesn't like disapproval or antagonism. He takes criticism personally. So he suffered."

But Teller did go ahead. He finally made an appeal to the scientific community that, in retrospect, is remarkable mostly for having been necessary. In an article entitled "Back to the Laboratories," in the *Bulletin of Atomic Scientists*, Teller sought to impress some of the simple facts of twentieth-century life on his learned colleagues. It merits careful rereading.

President Truman has announced that we are going to make a hydrogen bomb. No one connected with the work on atomic bombs can escape a feeling of grave responsibility. No one will be glad to discover more fuel with which a coming conflagration may be fed. But scientists must find a modest way of looking into an uncertain future. The scientist is not responsible for the laws of nature. It is his job to find out how these laws operate. It is the scientist's job to find ways in which these laws can serve the human will.

However, it is not the scientist's job to determine whether a hydrogen bomb should be constructed, whether it should be used, or how it should be used. This responsibility rests with the American people and with their chosen representatives. [Authors' italics.]

Personally, as a citizen, I do not know in what other way President Truman could have acted. As a scientist, I am troubled by other questions, more limited, more specific, but not less urgent

and not less harassing. Can a hydrogen bomb be built? How can we build it? Can we build it before the Russians succeed in doing so?

I cannot answer these questions. Even the elements which will be used in answering them cannot be mentioned publicly. But the background from which we start in our work can be discussed, and this discussion may be found relevant.

The situation should be similar to the one in 1939. I am sure that all of us remember it well. A conference comes to mind. The scientists present were urging that work on atomic bombs should be started. We said that such bombs could probably be made. We said that the fate of the war which had started with the crushing defeat of Poland might hinge on atomic energy.

The colonel who was listening to us was not interested. He had heard too much of secret weapons. He told us about a goat which he had tethered for experimental purposes on his test site. He had offered a prize to any inventor of a new weapon which could kill the goat from ten paces. (I think he had death rays in mind—apparently the thing closest to atom bombs in his way of thinking.) The goat was still thriving. “Moreover,” the colonel went on, “wars are not won by weapons. They are won by the justice of the cause.”

Tempora mutantur. I have not met any skeptic like that colonel in army uniform for a long time. Today there is a discussion of the possibility of a new weapon; already it is considered a reality.

On the other hand, many of the scientists now think, “Peace is not won by weapons.” Ghost of the colonel!

To my mind we are in a situation not less dangerous than the one we were facing in 1939, and it is of the greatest importance that we realize it. We must realize that mere plans are not yet bombs, and we must realize that democracy will not be saved by ideals alone.

Our scientific community has been on a honeymoon with mesons. The holiday is over. Hydrogen bombs will not produce themselves. Neither will rockets nor radar. If we want to live on the technological capital of the last war, we shall come out second best. This does not mean that we should neglect research or teaching. If we get to work now, it will be sufficient to have perhaps one-quarter of the scientists engaged on war work. The

load could be lightened by rotation. If we wait too long, not even the effort of all the scientists will suffice.

Do we dare hope that all citizens in their turn will realize: democracy will not be saved without some daring ideals? I do not believe that the hydrogen bomb or the whole arsenal of technological warfare will save the United States unless we accept the fact that the United States and all the freedom-loving people of the whole world must be saved. The grim alternative is that all of us will live under tyranny.

Many of our friends are disheartened. They had some hope in the summer of 1945. But if the atom bomb did not help to establish peace, why should the hydrogen bomb? Why should anything else for that matter? I think we should try again. The situation is now different. We have now a success and a failure behind us: The scientists enjoy the prestige of having successfully made atomic weapons; their advice may have a somewhat greater weight now. We also have had the experience of a dismal failure; we did not have enough realism, courage and initiative at the time of Hiroshima. We did not, in fact, win the peace. We must try again; there is no other way. Such a new attempt cannot come from the scientist, however strongly he feels about the subject. The primary responsibility for action lies with the groups directing the policy and foreign relations of our country.

To the scientist, at least, it should be clear that he can make a contribution by making the country strong. And he can continue to make a contribution by explaining this dangerous world to his fellow-citizens.

Chapter 12

PAINFUL PROGRESS

THE SURPRISE march of the North Korean Communists into the Republic of South Korea on June 25, 1950, interrupted the campaign against the hydrogen bomb. The demonstrated fact that the Communists were willing to resort to armed aggression to achieve their world-wide aims sobered a few of even the most fuzzy-minded U.S. scientists. Arguments about the "immorality" of the H-bomb began to sound hollow in the face of North Korean bullets. Some scientists came over to Teller's side and offered to help.

In Washington, the general rearmament plan gave the thermonuclear program a new priority. A pro-H-bomb member of the Atomic Energy Commission, Gordon Dean, replaced anti-H-bomb man Sumner T. Pike as Chairman. Plans were hurried for a major expansion of AEC production facilities, including the construction of five huge new piles to make both tritium and plutonium at Savannah River.

But the H-bomb fever had not yet reached Los Alamos—at least not in epidemic form. Only Teller, and the handful of scientists who had earlier volunteered, or switched over after Korea, plugged away on the hydrogen-bomb project. The remainder of the staff at Los Alamos undertook an all-out program aimed at improving the nation's atomic bombs, a program that had been advocated by Oppenheimer's General Advisory Committee, and by many scientists during the anti-

H-bomb campaign, though not before. The Los Alamos scientists seemed willing to work on any project except the hydrogen bomb.

Indirectly, the Korea-generated burst of activity at Los Alamos was to have a significant bearing on Teller's thermonuclear program. Since every improvement of the uranium bomb was a step in his direction, Teller applied his thought and energies in this direction as well.

Along with other scientists at the weapons laboratory, he helped evolve a new method of exploding uranium, one that had been foreseen during World War II but that the General Advisory Committee recommended against pursuing in the years before "Joe One." The method has since been described in many published articles by scientists and science reporters.

Uranium explodes when a certain weight of the metal, called a critical mass for obvious reasons, is brought together. Sparked by Teller's intuition, the scientists at Los Alamos began to reason that if the amount of uranium used was reduced at the same time the density was increased, the same explosive effect might be obtainable. This "squeezing" effect could possibly be achieved, they reasoned further, by placing a large quantity of TNT or other high explosives around the edge of a small sphere of U-235 or plutonium. Because it only used a fraction of a critical mass, these bombs soon became known at Los Alamos as "fractional-crit" bombs. The implications of this were not lost on Teller.

Accordingly, Teller and his small handful of associates persuaded Los Alamos Director Bradbury and the Atomic Energy Commission in the midsummer of 1950 to undertake the first thermonuclear test. Back from Washington came the word that the test would be held, not in Nevada, but at the AEC testing ground in the Marshall Islands of the Pacific.* The test had been assigned the code name "Operation Green-

* And, on recommendation of the General Advisory Committee in Washington, at a later date than the Los Alamos proposal.

house," to be carried out by a special task force in the spring following the Nevada fractional-crit tests. To command the joint AEC, Army, Navy, Air Force task force, the Pentagon had assigned Lieutenant General Elwood R. (Pete) Quesada. For "Greenhouse" Los Alamos would design and build an atomic bomb designed to explode a mixture of deuterium and tritium in a thermal reaction. It would be man's first attempt to light the fires of the stars.

Teller himself was afire with enthusiasm, but once more the fire failed to spread at Los Alamos. The resistance to the thermonuclear program continued. The discouraging tritium calculations proved to be a severe setback for Teller. The staff of the weapons laboratory was busily engaged in preparations for the forthcoming Nevada tests and could find some justification for its unwillingness to get involved in Teller's work.

At about this same time, Dr. Oppenheimer conducted a second panel on long-range objectives for the Department of Defense. The question of the status of the hydrogen bomb came up, and the panel slightly ruled that it was a "long-range" project. This panel report was used against the H-bomb program at Los Alamos.

Dr. Alvarez has discussed one of the controversial points of the panel. He said: "I remember one statement that Dr. Oppenheimer made because it shocked me so greatly and I repeated it to several people when I got home. . . . Dr. Oppenheimer said essentially this: 'We all agree that the hydrogen-bomb program should be stopped, but if we were to stop it or to suggest that it be stopped, this would cause so much disruption at Los Alamos and in other laboratories where they are doing instrumentation work that I feel that we should let it go on and it will die a natural death with the coming tests [which were the "Greenhouse" tests] when those tests fail. At that time will be the natural time to chop the hydrogen-bomb program off.'

"I assumed that I had been put on this committee to present

views in favor of the hydrogen-bomb because I had been always of that point of view. I didn't object to Dr. Oppenheimer's statement because he said that he was not planning to stop the program. My feeling at the time was that if the 'Greenhouse' test failed, and then Dr. Oppenheimer or the GAC did something to stop the hydrogen-bomb program, then would be a good time to fight. It seemed to me to be quite useless to express disapproval of this because nothing was being done to stop the program.

"However, I found later much to my dismay that my own political naïveté in matters of this kind led me astray and I found that the report which I signed and I am sorry to say I signed, did do the program great harm."

Later Teller said to Alvarez: "Louis, how could you ever have signed that report, feeling the way you do about the hydrogen bomb?"

Alvarez replied: "Well, I didn't see anything wrong with it. It said the hydrogen-bomb program was an important long-range program. Our particular emphasis was on small weapons, but that is a program that has no standing in the Commission's program now, and I think we should go ahead with it."

"You go back and read that report," Teller said, "and you will find that [it] essentially says that the hydrogen-bomb program is interfering with the small-weapons program, and it has caused me no end of trouble at Los Alamos. It is being used against our program. It is slowing it down, and it could easily kill it."

Immediately after the report was published, Major General Roscoe Charles Wilson, a military consultant to the Committee, went to the Director of Air Force Intelligence to register a complaint about Dr. Oppenheimer. Said Wilson later: "I was worried about something I could not put my hands on. . . . This was a matter of real worry that a general pattern of activity coming from a man of such stature seemed to me to be jeopardizing the national defense."

In the course of the fall, Teller won at least one convert, the new commander of "Greenhouse," Pete Quesada.

Young-at-heart (and in appearance) Quesada was an old-time Air Force pilot who learned to fly in a Jenny "when dogs used to run along the ground barking at the shadow of the plane." Along with Ira Eaker and Carl (Tooey) Spaatz, he helped establish the world's flight-endurance record by keeping the airplane "Question Mark" in the air for an entire week.* During World War II, Quesada had proved himself an able air strategist when he bossed an air division in Vandenberg's Ninth Air Force. Quesada, who like many military men had not yet halfway grasped the meaning of thermonuclear explosion, was staggered by what he learned from Teller. He instantly appreciated that the hydrogen bomb, if successful, would be a new order of military weapon, and that of all the services, his own, the Air Force, would stand to gain most by its successful development.

Quesada also learned of the continuing opposition to the H-bomb program. From Teller, Quesada caught a feeling of anxiety about the tests. He soon saw that failure of "Greenhouse" might be a serious, if not permanent, setback to the hydrogen-bomb program, since the opponents would use it as "evidence" of the futility of the effort. For Quesada and other Teller backers, "Greenhouse" became a major challenge.

In the meantime, in January, 1951, the tests of the fractional-crit bomb† were carried out at the AEC's new test site in Nevada. The results exceeded all expectations. The good citizens of Los Angeles and San Francisco got the news without understanding its significance, when, hundreds of miles from Yucca Flats, they saw the flash of the explosion. Development of the "squeezed down," or fractional-crit, bomb, re-

* The "Question Mark" was kept aloft by means of the first crude in-flight refueling system.

† In early 1948, the General Advisory Committee had recommended against work in this field.

quiring vastly less fissionable material, automatically, in effect, increased the stockpile of U.S. atomic weapons manifold.

While the Nevada tests were being prepared, Dr. Stanley Ulam, a Los Alamos mathematical physicist, was working on a theory related indirectly to the thermonuclear problem. Teller, with his characteristically insatiable curiosity, got into a conversation with him about his paper. Not long afterward something Ulam had said in passing turned on a small light somewhere in Teller's storehouse of ideas. That evening as he and his close associate, Freddie de Hoffmann, were leaving the barbed-wire-enclosed laboratories at Los Alamos, Teller said absently: "I think I have an idea." De Hoffmann thought nothing of it "because after all Edward is always having an idea."

"But the next morning he came in to see me and said, 'Freddie, I think I really have something. Stick some figures into it.' He told me about it and I started to work with my desk calculator. The answer came out right."

The missing "sixth idea" for the hydrogen bomb had been found. It was the direct route to a transportable bomb, which not only dispensed with the need for refrigeration but would eventually dispense with tritium. It would start the atomic scientists down the road to a method of making thermonuclear bombs so cheap and easy to produce they would come to be known as the "baking-powder bombs."

Teller's new idea became known as the "new concept." It enjoyed brief popularity among the intellectually curious physicists at Los Alamos. Then, once again the built-in hostility to the thermonuclear program, now enlarged to include Teller as an individual, set in. Teller found it impossible to get the necessary help at Los Alamos to carry on with his "new concept" at the pace he thought the idea and program deserved.

As the days went by, Teller sensed that he was fighting a lost cause. The AEC scientists at Los Alamos continued to show little interest in his new concept and saw no need for taking any special action or reorganizing the thermonuclear

program. One day Teller concluded that if his new ideas for the hydrogen bomb were ever to be a success, he had to get out of Los Alamos, away from the indifference and outright hostility. Teller decided to ask the AEC for a completely new weapons laboratory, with separate staff and equipment.

The very thought of it was fantastic: an entire new laboratory that would cost upward of twenty million dollars (the cost of Los Alamos is estimated at a hundred million) to start. It would require elaborate equipment and the recruiting of hundreds of outstanding young scientists in the face of the campaign against the hydrogen bomb. Difficult as the enterprise seemed, Teller had reached the conclusion that unless he could get away from Los Alamos, the very security of the nation was in grave danger.

Above all, Teller believed that the creation of a new laboratory would be an important goad to the staff at Los Alamos. Just as competition spurs men to greater activity in other endeavors, he reasoned, it would specifically in weapons development. If the Los Alamos staff saw another weapons laboratory at work on a thermonuclear program designed to create weapons of a thousand times the power of atomic bombs, no force on earth would keep it content to tinker along with conventional A-bombs.

The way to get action, Teller concluded, was not to stay at Los Alamos and fight hostility and inertia but to get out and put Los Alamos in a highly competitive race.

Over the heads of everyone in the Atomic Energy Commission, Teller went straight to the Chairman, Gordon Dean. Outlining his new ideas for constructing the hydrogen bomb, he told Dean that if they were to be pushed through to completion, then he, Teller, would have to have a new laboratory and equipment, separate and distinct from Los Alamos.

Dean, who had himself been deeply involved in the secret H-bomb struggle of the year before, needed no lecture to grasp the attitudes at Los Alamos. He also quickly saw the true significance of Teller's new concept—if it worked. Never-

theless, Dean was unconvinced about the need for a new laboratory.

He argued that the laboratory would cost a lot of money. Morale at Los Alamos would probably be greatly impaired if Teller was given a new competitive establishment. The move would divert attention and work from the atomic weapons program at a crucial time. Finally, Dean told Teller it was not likely that Teller could get competent men to man the new laboratory, especially in the light of the campaign against the H-bomb.

Dean approved going ahead with the new concept, provided the work on it was carried out at Los Alamos. The General Advisory Committee was also opposed to the second laboratory. The GAC, which during the bitter fight in the fall of 1949, had said that the H-bomb should not be built because, among other things, it would interfere with normal atomic-bomb progress at Los Alamos, now said that the facilities at Los Alamos were quite adequate for both H-bomb and continued A-bomb development.

More discouraged than ever but unwilling to quit, Teller dined that night at Washington's Metropolitan Club with McMahon's trusted assistant William Borden. Teller outlined his new concept of the hydrogen bomb. Then, with much emotion, Teller made his case against Los Alamos and for a second H-bomb laboratory. By the end of dinner, Borden had promised Teller that he would have his laboratory.

While in Washington Teller also went to see a friend, Professor Louis Nicot Ridenour, who was chief scientist for the Air Force. Teller discussed with Ridenour the upcoming "Greenhouse" tests, which for the first time on earth would—if successful—produce fusion of the light elements. Then Teller related his new concept and told how he was trying to get a second laboratory with equipment and staff in order to put the new theories to actual test.

Ridenour agreed to help. But he cautioned Teller that before the Air Force generals would really be moved into action,

there must first be something tangible for them to see. Perhaps after "Greenhouse," Ridenour stated, the Air Force could be persuaded to back Teller's new laboratory, if it could be shown that the Air Force stood to gain by such an effort. Teller thanked Ridenour and promised to return after the tests to receive the Air Force's backing and support.

On this trip east, Teller also sought out his old friend Lewis Strauss, who, though he was in private business as the financial adviser to the Rockefeller brothers, continued to have influence in Washington and, strangely enough, at the White House. Democrat Harry Truman retained great respect for the judgment of this Republican banker on atomic matters.

Strauss was heartened to hear of the new concept, saddened to hear again of Teller's continuing troubles at Los Alamos. He agreed to help Teller fight for a new atomic-weapons laboratory.

Slightly encouraged by his minor political success in Washington, Teller returned to Los Alamos and set to work with his handful of assistants. On his return he was summoned to Director Bradbury's office to hear that Bradbury had learned of his activity in the east. Bradbury was furious, charged Teller with disloyalty to Los Alamos and its Director. He accused Teller of violating the Atomic Energy Act's secrecy provision in discussing the subject of a new laboratory and reasons for it with Lewis Strauss, who was no longer in the government service.

On his office wall Teller found some consolation in a fervent prayer, from poet Arthur Guiterman, that Strauss had once sent him:

Providence, that watches over children, drunks and fools,
With silent miracles and other esoterica,
Continue to suspend the ordinary rules,
And take care of the United States of America.

Chapter 13

“GREENHOUSE”

BEFORE QUESADA'S TASK FORCE THREE arrived on Eniwetok atoll, a large sandy oasis in the middle of the Pacific Ocean, it was about as U.S. Marines and Army troops had left it after their historic battle to wrest it from Japan in 1944. The many small islands that enclose an oval-shaped lagoon twenty-five miles long and twenty-five miles wide were pock-marked with shell and bomb craters, littered with rusting tanks and gutted landing craft.

Task Force Three transformed this battleground of World War II into a thriving community of the atomic age. "We built a new field laboratory in the middle of the Pacific," Quesada recalls.

Eniwetok Island itself now had a large, well-equipped airfield, complete with all essential facilities for piloted and pilot-less aircraft. The atoll boasted two athletic fields, two moving-picture theaters, a chapel, a clothing store, beach clubs for officers and enlisted men, a library, hobby shops, electronics buildings, a set of quarters for the Commanding General, a maintenance hangar, personnel landing pier, a mess hall, dispensary, a post exchange, post office, laundry, and well-equipped power plant.

At one time during an atomic test, there were ninety baseball teams competing in ten organized leagues on Eniwetok. The beach clubs, as one Eniwetok visitor described them,

“provided everything that is to be found in any exclusive beach resort . . . the beach and surf are a combination of Waikiki and Rio de Janeiro.” The telephone exchange at Eniwetok could handle more than six thousand calls per day; one mess hall served over nine thousand meals a day. A radio station with a complete daily program operated around the clock; regularly scheduled busses ran hither and yon across the island’s paved streets.

At the extreme end of the atoll, in the opposite direction from Eniwetok, is another of the larger islands—Engebi.

In between Engebi and Eniwetok were the hundreds of other islands that make up the large atoll. The names of these islands were practically unpronounceable: Muzzinbaikku, Kirinjan, Bokonaarrappara, Yeirim, Aitsu, Eberiru, Aomonpursai, Sanil, Elugelab, Teiter, Bogairikk, Bogon, and others. Some of these islands or sand spits, like Elugelab, have already found a niche in history. They have been blown out of existence by man’s first experiments with thermonuclear energy.

The purpose of building AEC’s Eniwetok atoll laboratory was to provide a test area for atomic bombs that were too large to be exploded inside the continental limits of the United States. The actual atomic explosions occurred on several islands of the atoll that were especially selected as “shot” islands.

Before and after each blast, these islands were heavily populated. Buildings, factories, shelters, boxes, instruments, tubes, trucks, bulldozers, dotted the islands. When the time drew near for the atomic blast, the men began removing most of the equipment via boat or helicopter. Last to go were the collapsible living quarters. After the shot, they were also the first to be returned.

The gathering of data from such test explosions—an occupation that concerns most of the thousands of men at the testing grounds—is an exacting science. In some cases, special instruments set close to a burst measure events that took place within a fraction of a millionth of a second. The data is transmitted to a safe place where it can be recorded before the

detecting instruments are vaporized. Some measurements depend on laboratory analyses of samples flown from Eniwetok to continental laboratories such as Los Alamos, thirty to forty hours after each test detonation. Other measurements depend on the use of high-speed cameras operating at speeds up to a million frames per second or more.

There are a variety of other types of instrumentation, including photocells, photomultipliers, ion chambers, and even such complicated instruments as mass and beta-ray spectrographs. The complexity of the instrumentation is the reason why the tower method of detonating shots is used, instead of air drop, which might appear more realistic from a military standpoint. The towers are huge, massive steel frames that reach as high as two hundred feet into the air and resemble TV antennas.

Before, during, and after each test shot, the AEC is careful to maintain tight security throughout the entire Pacific testing grounds. Accordingly, Army MP's, dressed in khaki shorts (the uniform of the day at Eniwetok) and equipped with sidearms, guard the facilities and equipment on the atoll islands. All hands wear identification badges with pictures at all times. Not all personnel are admitted to all sections of the atoll, only "Q" cleared men are permitted into the most secret areas.

In the air and sea surrounding the Eniwetok area, security is enforced by scores of Air Force aircraft and Navy patrol vessels. The Air Force maintains a continuous safety patrol of the skies around Eniwetok over an area of more than four hundred square miles. The Navy is responsible for safety on the seas for an equally large area around the atoll. During operations, the Navy employs a dozen-odd destroyers for patrol work, countless small craft, and usually an escort carrier, which lies off "shot" island with helicopters on board—so that the scientists can fly to the scene of the blast immediately afterward to gather up precious data.

In the spring of 1951, while Teller and his assistants, in-

cluding Dr. Frederic de Hoffmann, worked day and night on the test devices in order to have them ready in time, men and scientists began assembling in Eniwetok to carry out operation "Greenhouse." Quesada was on hand to greet the men who arrived. One of those later wrote: "General Quesada is a natural leader. His boyish enthusiasm is infectious. He fairly bubbles over whenever he discusses the operation and displays a courtesy and understanding which blanks out the three stars on his collar."

The men who came to Eniwetok to watch the explosion of the world's first thermonuclear device were divided roughly into two groups: those who did not want to see it succeed and made a point of talking up the exorbitant cost of the device (in terms of tritium), and a smaller group who wanted the test to succeed, expensive or not. The latter group viewed the test in grand perspective: man's first attempt to create the stellar fires. They knew that for purely political reasons it was important that the test be successful. Otherwise, the charge could be made that the fusion of the light nuclei was impractical. Such a charge, following failure at "Greenhouse," would almost surely cut off all further U.S. research into the thermonuclear bomb, in spite of Teller's new concept.

By May, 1951, when the officials from Washington arrived—Joint Congressional Committee members and executive staff director Borden, Robert LeBaron, and others—Quesada's Task Force Three had already detonated two atomic bombs, in order to test blast effect on certain pieces of military equipment. Preparations were well underway for the next test.

Thirty-six hours prior to detonating the device troops carefully covered the secrets that had been put on the tower on "shot" island. Then came the signal to start evacuating. Living quarters were hastily disassembled, packed, and carried away by boat. One by one the men left the island. As each group left, it performed a certain mission; then, via radio, radio telephone, or walkie-talkie, the mission was recorded

and checked off on a master panel in the busy headquarters of General Quesada. The test procedure was so rigged that if one group failed accidentally to perform its mission, the others could not proceed.

There could be no mistake made, such as accidentally leaving a guard on duty on "shot" island.

On the day preceding the shot, Teller flew to the island, and along with his right-hand man, De Hoffmann, climbed the tower on which the huge device rested. Surrounded by elaborate refrigeration machinery (called the "dewar") needed to keep the tritium and deuterium at extreme low temperatures, the device was clumsy and bulky. The wind whipped the heavily laden tower back and forth. The two physicists worried lest they fall through the hole in the floor, leading down to the coral and sand far below.

After making last-minute adjustments, Teller and De Hoffmann went back to Eniwetok and spent the remainder of the day relaxing at the Officers' Club on the beach. They swam, donned diving masks and snorkel breathing apparatus, and explored the coral sea bottom. They had left one of their trusted associates, Dr. Herbert York, at work on the device on the tower on "shot" island, high above a sign that read "Danger. No Smoking. High Explosives."

The weather turned bad. Rains came in almost continual torrents. Periodical weather conferences were held in Quesada's headquarters. That night, as York worked hurriedly in his undershorts, rain beat down on him in sheets. When York was finally evacuated late in the evening, he feared that the test would be canceled because of bad weather.

On Eniwetok, Quesada and Teller were busy with the last-minute administrative work of conducting the tests. Though a great many of the personnel and brass had gone to an open-air movie (and were later drenched by the same rain that soaked York), many of them wished to be briefed on what was to occur the following morning just before dawn—weather

permitting. In particular, a group of Congressmen needed briefing.

Quesada nominated Dr. Teller. But Bradbury and some of his Los Alamos staff objected strongly. It would look as if Teller were being given all the credit, Bradbury protested, claiming that it would be bad for morale at Los Alamos. Quesada dismissed the Los Alamos objections and asked Teller to deal with the Congressmen.

In his easy, uncomplex manner, Teller briefed the Congressmen as requested. Many present were the semitechnical people who worked on the tests. One of them asked Teller point-blank if he thought the test would be a success. In a low voice, Teller replied: "It will be successful."

After the briefing, Teller bumped into his friend, Dr. E. O. Lawrence, who had attended the movie with Gordon Dean and Sterling Cole. Teller whispered to Lawrence that he was beginning to lose his confidence. "It won't work," Teller predicted glumly. Lawrence, who knew better, snapped back: "Edward, I'll bet you five dollars that it does."

Later that night, in a highly emotional state, Teller walked silently along the beach at Eniwetok with Bill Borden. Suddenly, he began to talk: "This is more than just proof that a bomb will or will not work. This is a great scientific experiment. If it is a success, it could even mean that mankind has achieved a new means of obtaining energy, just as Enrico Fermi proved in December, 1942. It will mean that later all mankind can someday benefit from the immense power derived from fusion."

Not until the early morning hours of "shot" day did the weather clear. The test was delayed three hours. Just before dawn, the mechanics began warming up engines on the pilotless aircraft at the airstrip at Eniwetok. Then, eerily in the dark, they sped down the runway and up into the sky. Mother planes, circling nearby, took over direction of the drones—B-17's, B-50's, F-80's, and one B-47 jet bomber—and guided them toward "shot" island.

Zero hour was fast approaching.

All official observers were taken to the Officers' Beach Club on Eniwetok. As final preparations were being made, the brass were served coffee and sandwiches. Chairs were arranged in front of the club along the beach facing the direction of "shot" island. Dark glasses were distributed, and the guests were warned not to take them off for at least three seconds following the appearance of the fireball.

A loud-speaker attached to a palm tree kept the observers informed of the progress being made. As the test schedule progressed, each new action was elaborately explained. While the loud-speaker ticked off the minutes, Quesada and Teller walked out onto the club dock to get a better view.

On nearby Parry Island, an Air Force major who had watched many atomic tests, gathered with a group of companions in order to get a better view. Suddenly there was a loud, deafening blast—just before scheduled zero. Through instinct, the crowd of observers, with the major, hit the dirt—looked for shelter that wasn't there. Then someone saw the smoking paper bits of the giant firecracker the fun-loving major had tossed to the ground.

The loud-speaker at the Officers' Beach Club ticked off the last ten seconds: "Ten. Nine. Eight. Seven. Six. Five. Four. Three. Two. One."

Then, the momentous signal came: "T-Zero."

A tremendous ball of flame erupted. Simultaneously, a blast of heat swept across the Beach Club grounds, followed closely by a loud rumbling in the loud-speaker, as the noise from the explosion passed Parry Island. Then, like a great thunderclap, the sound struck Eniwetok.

One observer later described his reactions:

The heat was simultaneous with the sight of the fireball through our dark glasses (so dark that if you looked at the sun it was only a faint pinprick) and the feel of the heat at some eighteen or so miles was as though you had suddenly opened an oven door.

However, nuclear explosions have always impressed me as being very finite. As the cloud moved away (after veering very close to Eniwetok Island) there was a hell of a lot of Pacific in every direction, not even remotely affected, as far as the eye could see. And you wouldn't have known from what you could see that it had gone off.

Though the explosion had been an awe-inspiring sight—man's biggest fireball—it was not known immediately whether or not it had been entirely successful. The instruments on the nearby islands and in the pilotless aircraft that had been flown through the blast had to be examined before the scientists would know whether the proper percentage of tritium and deuterium had burned.

While the task force waited the results, Quesada suggested that Teller be flown up to "shot" island to observe at close range the results of the tests. When he heard of the suggestion, Bradbury once again protested to Quesada. It would look as if Teller were being given exaggerated credit again. Again, Quesada overrode the objections and sent Teller winging toward "shot" island in an Army L-13.

As they flew toward the island, the pilot invited Teller to take over the controls of the light plane. Teller's wide-set, deep-blue eyes sparkled at the suggestion, and he grabbed the stick eagerly. The plane zoomed wildly across the sky as Teller's excitable, inexperienced touch moved the controls.* Nothing remained on "shot" island except the charred stumps of a few palm trees. The huge steel tower—equal in height to a multistoried office building—from which the device had been detonated was nowhere to be seen. Tons of steel had been vaporized in the explosion.

In the early afternoon, the official results of the test came

* After "Greenhouse," Teller talked more often about flying the liaison airplane than he did about the results of man's first attempt to burn tritium and deuterium.

in: the percentage of tritium and deuterium burned in the heat of the fission explosion far exceeded that hoped for. The test was an unqualified success. It had been proved beyond further doubt that thermonuclear reactions were possible.

Only a handful of scientists on Eniwetok were first informed, lest the word be too widely spread (mail was not censored on Eniwetok). That afternoon, Dr. E. O. Lawrence had to catch a plane back to the U.S. Teller saw him off at the airstrip and discovered that Lawrence had not yet heard the good news. Though he could not officially break the secrecy Quesada had imposed, Teller slipped a five-dollar-bill into Lawrence's hand. Quietly, Lawrence clasped Teller's hand in congratulations.

Later that afternoon, Dr. Teller, Major General Robert M. Lee, commander of the Air Force contingent, and Congressman F. Edward Hebert, of Louisiana, were sitting in chairs at the Officers' Club, discussing the significance of the test.

Lee recalled that he had once been stationed at Barksdale Field in Hebert's state of Louisiana and often had flown down to Baton Rouge during the Biff Jones era to see the Tigers play. He had also landed at New Orleans for the dedication of the Shushan Airport.

"When it was built and dedicated in 1933," Hebert observed, "Shushan was the most modern airport in the entire United States. Today, just so few years later, it is obsolete."

Teller interrupted: "In 1934, nobody had ever heard of the atomic bomb. Today it is obsolete." *

The Atomic Energy Commission has never officially commented on the final shot at Eniwetok. (Indeed, the AEC rarely comments on anything.) However, when scientific discoveries of a major order of importance are made, in spite of government policy, it is often difficult to keep the secret.

* On arriving back in the United States, Louisiana's Congressman Hebert wrote: "The H-bomb is the atom bomb dipped in Hadacol."

The scientists soon began to talk of "brilliant inventions" and "revolutionary developments" in the thermonuclear field.

Much later President Eisenhower was to reveal in his memorable address to the United Nations in December, 1953, that the uranium bomb had been refined to a weapon with twenty-five times the force of that of Hiroshima. This would indicate that the uranium bomb had been improved to the point where it could produce temperatures in the neighborhood of hundreds of millions of degrees. If so, the scientists had a match hot enough to light a full-scale thermonuclear explosion. They would not necessarily need a refrigeration plant to keep the trigger cold.

Not long after "Greenhouse," several important trends in the U.S. atomic-energy program became obvious. A "Dawn of Atomic Plenty" suddenly had occurred. It was a dawn that could have occurred far sooner if the U.S. had not been complacent about its atomic monopoly. At the conclusion of the Nevada tests in the fall of 1951, Dr. Alvin Graves stated that during 1951 the AEC had more than doubled its knowledge of atomic weapons, and the stockpile had been increased on a comparable scale.

Atomic bombs were fired off helter-skelter during 1951. More than eighteen atomic blasts were officially acknowledged (from 1945 to 1951 only eight, including the two that were dropped on Japan, were fired). There was suddenly enough fissionable material in the nation's locker for such devices as atomic-powered submarines, for which the Navy let a contract in September, 1951.

Brien McMahon, the one U.S. layman who knew more about atomic developments than all others, became carried away by the apparent enormous supply of bombs that the U.S. had—or could have—in its stockpile. In a major speech in September, 1951, he pointed out that the military was spending less than three cents of every dollar on the nation's best weapon, atomic energy. He called on the Army, Navy, and

Air Force to abandon traditional concepts and weapons and create an “atomic Army, Navy, and Air Force” equipped with thousands of relatively cheap atomic bombs, missiles, and artillery shells.

Even to the untrained observer, it was obvious that revolutionary events had occurred in atomic weapons development.

Chapter 14

THE SECOND LABORATORY

THE NEWS OF "Greenhouse" traveled quickly to Washington and to Los Alamos. Pleased with the reaction, Teller passed the time at Los Alamos examining late-arriving test data. He was eager to press forward with a test of a full-scale thermonuclear explosion.

Better than anyone, Teller realized that the "Greenhouse" shots had only been experimental. Many hours of hard work and further experimentation lay ahead before the U.S. could find comfort in the knowledge that its arsenals contained a minimum supply of transportable, full-scale thermonuclear bombs. Since the foot-dragging at Los Alamos continued, a second laboratory, he believed more than ever, was an important objective.

Time, Teller believed, was fast running out on the United States in a race it seemed hardly aware of for atomic-weapons superiority. The hour was extremely late for creation of a new laboratory, but he still believed firmly in his theory that the results could be forced out of Los Alamos by competition. Moreover, there was work enough in the thermonuclear program to keep two laboratories working at crash speed.

Hoping that his own prestige had increased to the point where he might successfully sway the government to his view,

Teller set out for Washington. Almost immediately after arriving in the capital, he encountered General Quesada, who had just returned from the Pacific testing grounds. Over dinner later that night, Teller told Quesada of the increasing significance of some of the final laboratory analyses of the data from the test shot. Everything indicated success far beyond Teller's most optimistic hopes. Quesada was delighted. That night he promised Teller he would begin a campaign to educate the Pentagon to the new revolution.

Meanwhile, the results of "Greenhouse" had caused a minor sensation behind the guarded walls of the Atomic Energy Commission. Teller's new concept had a direct bearing on almost every AEC program, weapons, production, research, and atomic power alike. Gordon Dean was so impressed that he decided to hold a mass meeting of all the Commissioners and the General Advisory Committee, plus any other U.S. scientist who wished to attend. At Oppenheimer's request, the meeting was set for early June at his headquarters at Princeton University.

The nation's leading scientists gathered at Princeton for the important meeting. Among them were Oppenheimer, Bethe, Teller, Bacher, Fermi, Von Neumann, Nordheim, Wheeler, and others. The meeting lasted for three days. Before the formal conference began, Oppenheimer and his friends were openly hostile to the H-bomb. After three days of logic, facts, and figures on the new concept presented by Teller and his friends, further opposition to the H-bomb program seemed patently not in the best interests of the nation. Oppenheimer and other members of the GAC were won over. "They switched a hundred and eighty degrees," one observer put it. By the end of the meeting, Oppenheimer and friends unanimously endorsed a program aimed at developing thermonuclear bombs from Teller's new concept.

One scientist present described the scene: "Teller finished. There was a brief silence. Chairman Oppenheimer finally spoke.

“‘That’s it,’ he said. It was like the end of a championship chess game. One opponent had seen the outcome and resigned.”

A test of Teller’s theory through a full-scale thermonuclear explosion had to be made. The suggestion was made at Princeton that Teller’s new idea be used in a field test.

This was still some distance away from the final solution since, while a new approach had been found, the hydrogen “bomb” would still be “in the deep freeze,” as one scientist put it. The proposed device would be unwieldy and immense (it actually weighed sixty-five tons). It was necessary to proceed with the test, Teller believed, in order to establish that a full-scale thermonuclear explosion could in fact be produced with the “Greenhouse” trigger. The experiment would, as it turned out, lead to a costly dead end, but no other path to a final answer was then in sight.

The proposed device was given the code name “Mike.” Then a debate followed over when the test, named “Operation Ivy,” should be carried out. Dr. Bradbury and the Los Alamos contingent suggested that the test be run off in 1953. Teller’s friend John Wheeler (who seemed more optimistic than even Teller on this point) rose up and said: “This will work, and we must test in the summer of 1952.” The date was finally set for the fall of 1952.

An argument arose at the Princeton seminar, however, on the point of whether President Truman’s H-bomb directive, even as rewritten on the demands of the Congressional Committee, would permit the AEC to go ahead as Teller proposed. A full year and a half after Truman had, in fact, intended to order building of the H-bomb, there apparently was a question in the minds of some of those responsible for atomic energy as to whether they were actually to proceed to build hardware.

While this important AEC meeting was taking place, General Quesada had gone to the Pentagon to do two things: (1) educate the military brass to the revolution that had oc-

curred on Eniwetok, and (2) warn the military that certain scientists were deliberately lobbying against the military-weapons programs within the AEC, and especially the H-bomb program.

When the General arrived at the Pentagon, he was amazed at the indifference with which top brass viewed his historic Pacific experiments. Air Force officers, including the Chief of Staff, the late General Hoyt Vandenberg, seemed unimpressed with both the results of "Greenhouse" and Quesada's serious concern over the scientific opposition to the thermonuclear bomb. No one in his own service seemed to see or appreciate the fact that the thermonuclear bomb could be the most potent weapon the Air Force could ever hope to have in its arsenal.

Part of the indifference could be attributed to traditional military skepticism about scientific gadgets, part of it to a bitter internal dispute in the Air Force over the use, or non-use, of low-yield or tactical atomic bombs that had been perfected at Nevada six months earlier. The Air Force was divided in debate over the wisdom of manufacturing the small bomb. Proponents of the Strategic Air Command and its doctrine of heavy retaliatory bombing—unaware that a revolution had taken place in the field of atomic weapons—were arguing that the nation's scarce supply of fissionable materials ought to be kept exclusively for use in the larger, more efficient bombs.

In addition to its internal troubles, the Air Force was caught up in a bitter interservice struggle with the Army and Navy. The Joint Chiefs of Staff had been told by the National Security Council to provide a set of force levels that would be sufficient to put the U.S. in a position of strength for a long period of world tension with the Communists. This order led to a famous set of debates in the fall of 1951, with the Air Force advancing the position that it had to have 143 wings as a minimum force, and the Army and Navy opposed. No one seemed to have time for Pete

Quesada, the man who, unknown to the Air Force, held the secret of its future pre-eminence in world military struggles in his head.

Quesada tried unsuccessfully to arrange an appointment with General Hoyt Vandenberg, who as first Air Chief to win general recognition of the dominance of air power, was in the middle of the 143-wing fight. Then he dropped down one echelon, sought out Air Force Vice Chief of Staff General Nathan F. Twining. After hearing Quesada out, Twining insisted that Vandenberg take time to see him.

At the appointed hour, Quesada arrived at Vandenberg's office with a carefully rehearsed speech on the revolutionary significance of "Greenhouse." He was shown into the Chief of Staff's office. Enthusiastically, Quesada began his dissertation on the thermonuclear bomb. He had not got very far when Vandenberg, obviously preoccupied with his fight with the Joint Chiefs, interrupted:

"Hell, I saw one of those atomic bombs go off out at Nevada, and it didn't even break a light bulb."

Unable to make headway with Vandenberg, Quesada did not press the thermonuclear bomb further with the Air staff. Not long afterward, Quesada, at the age of forty-seven, retired.

Though officially disengaged from the service, Quesada could not get his mind off either the thermonuclear bomb or Dr. Teller. He felt that failing to educate the Pentagon—and especially the Air Force—to the enormous significance of the thermonuclear bomb, he had let Dr. Teller and his associates down.

He decided to take the matter to Secretary of the Air Force Thomas K. Finletter. In November, Quesada sought out two research and development specialists in Finletter's office, Garrison Norton and William Burden.* Finletter had obtained

* Not to be confused with the Joint Congressional Atomic Energy Committee staff director, William Borden.

the services of these two men specifically to watchdog lagging Air Force technical and scientific programs. Norton and Burden immediately urged Finletter to take action.

Finletter decided to see Teller. A few days later Teller arrived in Washington from Los Alamos and spent a full afternoon with the Air Secretary. He told of the continuing opposition of the scientists to his project and made his case for the creation of a second laboratory. Teller recalled that Louis Ridenour, the Air Force Chief Scientist, had promised Air Force backing for the project—provided “Greenhouse” was a success.

Finletter called Dr. David Griggs (who had by now replaced Ridenour as Chief Scientist of the Air Force) to his office and told him to put the full weight of the Air Force behind Teller’s campaign to establish a second laboratory. Like Quesada, Finletter quickly grasped that of all services, the Air Force stood to gain most by backing Teller.

Congressional Chairman Brien McMahon was also campaigning to put Teller in his own laboratory. While Quesada was waging his futile campaign in the Pentagon, McMahon addressed several letters to AEC Chairman Gordon Dean, inquiring pointedly into the thermonuclear program and specifically into the matter of the second laboratory. Dean replied that he was opposed to the second laboratory. Of all the Commissioners, only Thomas E. Murray favored the Teller lab. Strauss had left the Commission.

McMahon continued to needle Gordon Dean and the Commission at every opportunity. By the fall of 1951, he had succeeded in creating so much agitation over the laboratory that Gordon Dean felt compelled to convene the General Advisory Committee for a judgment on the matter. Accordingly, the Committee met, under chairmanship of Robert Oppenheimer, and voted eight to one against the second laboratory. Dr. Willard F. Libby, the newest member of the GAC, was the lone dissenter.

The GAC decision infuriated McMahon. He became so annoyed, in fact, that he told Bill Borden to write up a special report to be issued in the name of the Joint Congressional Committee. To be included were these sentences that McMahon dictated: "The Committee specifically suggests that early consideration be given the possibility of a second weapons-development laboratory to supplement Los Alamos at least in certain engineering phases. . . . If the Committee has a single general comment to offer, it is this: Greater boldness and more scientific and technical daring should be brought to bear on the program."

The General Advisory Committee had voted against the second laboratory; the Joint Congressional Committee—which through Congress controls all AEC activities—had gone on record in favor of the laboratory. Gordon Dean was caught in the middle.

At this juncture of the political fight in Washington, a crisis occurred in Los Alamos. The strained personal relations between Bradbury and Teller became intolerable. Teller, who had found the essential clue to the hydrogen bomb, left the weapons laboratory. The circumstances of his departure have been obscured by euphemisms, but the fact is that he was forced out. Bradbury has since described the cause as a dispute over how the thermonuclear program should be run. Bradbury, who was officially responsible, had his own views. Teller had other views. Said Bradbury: "I had to do it in a way that seemed best to me. Ultimately Teller left."

It was Teller's view that Los Alamos still had failed to put the necessary effort behind the thermonuclear program. The departure of the one man who had consistently pushed for the hydrogen bomb and who, moreover, had conceived the way to build it had the predictable effect in Washington.

McMahon demanded that Dean convene the GAC once again to reconsider the earlier veto. In January, 1952, Dean complied, reconvened the GAC, and received its second "No"

on the question of the new laboratory. (Dr. Libby again dissented, voted "Yes.")

Early in June, 1952, the Atomic Energy Commission, in reply to a new series of inquiries from the Joint Committee wrote McMahon, again reaffirming its decision not to proceed with the second laboratory. The Defense Department gave an evasive reply. By then, Senator McMahon was bedridden with cancer, which would soon take his life. Bill Borden received the discouraging letter from the AEC and was unofficially notified that the AEC hoped these would be the final words on the matter.

Borden was distressed. Months were dragging by. Progress on the thermonuclear bomb still lagged. McMahon, Teller's strongest Washington backer, was ill, and, as Borden knew, dying. Soon the Joint Committee would be leaderless. More months would pass while a new chairman was selected.

Borden decided to make one final, bureaucratic tour de force to push the laboratory through. He composed a letter to the Defense Department's Military Liaison Committee Chairman, Robert LeBaron. He raised the question of whether LeBaron ought to invoke a special provision of the Atomic Energy Act and appeal directly to the President for a ruling on the matter of the second laboratory. Borden sent one copy of the letter to LeBaron. The letter touched LeBaron on a sensitive nerve, since it required the Military Liaison Committee to appeal to the President for a second laboratory or accept the blame.

The AEC heard about the letter and demanded copies, which were supplied.

• Meantime Finletter—after a trip to Los Alamos with LeBaron, Borden, Deputy Secretary of Defense William C. Foster, and others—had made an appeal for the second laboratory directly to Gordon Dean. Finletter pointed out that the various intelligence services had prepared estimates on the Soviet thermonuclear program that indicated that the Soviets might be making remarkable strides. Finletter declared that

it was imperative that the U.S. pursue its own thermonuclear program with more vigor.

About this time a report gained widespread circulation that Air Secretary Finletter had said during a Pentagon discussion of the H-bomb: "With seven of these weapons, we can rule the world."

The rumor, which apparently started on the Princeton campus, spread throughout the scientific and academic community and for a brief period threatened once again to provoke a serious sit-down strike against the H-bomb. The incident was reported to have occurred during a briefing of Air Force officers by Teller. Teller's friends asked Finletter about the statement. He denied it categorically. So also did every other person who attended the briefing.

Later Dr. David Griggs, the Chief Scientist for the Air Force, made a special trip to talk with Oppenheimer about the story, about Oppenheimer's alleged opposition to the second laboratory and to the hydrogen bomb in general. The meeting went on for about an hour.

Griggs began by informing Oppenheimer that he had heard the "rule the world" story from associates of his. Oppenheimer said he was familiar with the story, and reported that it had occurred at a briefing attended by Secretary of Defense Robert A. Lovett. Griggs then told Oppenheimer that he had been present at that meeting and that Finletter had said nothing of the kind. Oppenheimer replied that he had confidence in the reliability of his information.

The conversation then turned to other matters. On returning to the Pentagon, Griggs prepared a memorandum that, in part, stated:

After he had showed me the GAC recommendation of December, 1949, that the United States not intensify H-bomb development, but publicly renounce its development, and when I was pressing the point that such a course of action could well be disastrous to this country, Oppenheimer asked if I thought he

were pro-Russian or just confused. After a moment, I replied frankly that I wished I knew. He then asked if I had "impugned his loyalty." I replied I had. He then said he thought I was paranoid. After a few more pleasantries, our conversation came to an end.

Finally Finletter decided to move in the face of AEC resistance. He sent his assistants to begin negotiations with officials of the University of Chicago. They agreed to establish an Air Force laboratory to build the hydrogen bomb if Finletter desired. The project, code-named "Midway" in proper military fashion, was then put temporarily on the back burner, while Finletter moved to confront the AEC.

AEC Chairman Dean capitulated.

To make it official, he convened the General Advisory Committee for the fourth time and asked that the group rule on the second laboratory. This time, the GAC reversed its three previous refusals and, with Dean, agreed that the laboratory ought to be established. Ten days later, Commissioner T. Keith Glennan appeared before the Pentagon's Armed Forces Policy Council to report that the AEC had decided to move forward with the second lab.

Eighteen months had elapsed since Teller first asked for the laboratory. Senator McMahon died a few weeks later with the knowledge that more than any other man he had launched Teller on the way to the thermonuclear weapon.

In order to take advantage of existing facilities, personnel, and location, AEC Chairman Dean decided to locate the new weapons laboratory at the California Radiation Laboratory extension at Livermore, California. Operated by the University of California at Berkeley, the Radiation Laboratory had for years been under the charge of Teller's friend and backer, Dr. E. O. Lawrence. Commissioner Murray hurried out to the West Coast and on July 1, 1952, negotiated new multimillion-dollar provisions to the contract with the California Research and Development Company, to install additional laboratory

facilities and to construct thermonuclear devices. Teller's friend and associate, Herb York, was chosen to manage the laboratory.

Within the following few weeks, Dr. Teller discreetly passed the word through the universities that he was in need of recruits to man the AEC's new thermonuclear weapons laboratory. It was anxious business. One of the main arguments against the new lab was the prediction that no young, capable scientists would apply for work. The opposite occurred: Teller was overwhelmed by young and aggressive scientists, many of whom now came simply to work with Teller.

In 1946, Dr. Teller told a Congressional Committee:

Perhaps the most important requirement for successful scientific work is the encouragement of individual initiative. In organizing work on atomic power there exists the grave danger of too much planning, of too great centralization. Thus a mistaken idea, a single scientific prejudice in the minds of the planners, may render the whole program barren. Such rigorous planning will, furthermore, repel the best scientific talent.

Now, in his own lab at last, Teller had an opportunity to put his theory into practice. After Teller and York had selected their crew, the physicists laid down the basic research policy for Livermore: No idea was to be considered "too nutty." All hands would be free to pursue, within reason, any novel idea. The motto of Livermore was not conservatism but "aggressive adventurism." With such an atmosphere, Teller hoped to break away entirely from the overcautious, conservative approach to atomic weapons development that had dominated Los Alamos since the end of World War II.

Events in time were to prove that initially the greatest use of Livermore would be to energize Los Alamos, as Teller had long predicted. Once it was actually faced with a competitive situation, the Los Alamos laboratory threw its full energies

and very great talents into the thermonuclear program. In the end the more mature staff and the more experienced atomic scientists at Los Alamos significantly outpaced the new laboratory at Livermore in providing the hardware that became the hydrogen bomb.

Chapter 15

“IT’S A BOY”

AT LOS ALAMOS Teller had been held to be a difficult man whose presence was a source of general irritation and confusion. It would appear in retrospect that the cause lay entirely in the fight over the hydrogen bomb and Teller’s approach to U.S. strategy in the struggle with Soviet Communism.

Teller was never a man to look up into the western night and beat his breast in anguished cries of *mea culpa*. The younger scientists at Livermore found him a man of fixed political views, but politics were in no sense a preoccupation with Edward Teller.

The atomic weapon could be and should be, Teller held, the salvation of free man, not his destroyer. In a war of massed manpower, the West could not hope to survive.

“The Communist states would outmatch the West and defeat us in conventional war. Yet they dare not begin so long as we hold superiority in this weapon. So long as we can maintain this superiority we can survive.”

At Livermore, as at Los Alamos, Teller was exclusively a theoretician. The laboratory was under the general direction of Dr. Lawrence and managed directly by Herb York. Whatever Teller conceived in terms of nuclear theory was immediately available to both weapons laboratories, Los Alamos as well as Livermore. He spent only two days a week at the

laboratory for which he had fought so long. Since he was not an engineer or a technician, the job of making his theories materialize into hardware was one on which he could be of little assistance.

This was a job that had to be carried out by other men with special training. Consequently, Teller found it more useful to spend three days a week teaching at the University of California in association with Dr. Lawrence. There Teller conducted lectures in quantum mechanics for graduate students and did his bit to fill the acute shortage of pure scientists of which the U.S. had become increasingly aware.

Prior to World War II the U.S. lived almost in a vacuum of theoretical physics. Almost without exception the significant progress was made in Europe by Europeans. Many of the greatest minds were liberal. Between them Hitler and Mussolini created a climate in Europe that the important theoreticians found intolerable. Thus, the U.S. got its important and lifesaving brain transfusion.

Since World War II, as a result of this migration of the Fermis, Bethes, Tellers, the important work in physics has been done in the United States. Only the Soviet Union has matched, visibly, the U.S. advances and this with an undetermined amount of treasonable assistance. There are strong indications that the Soviets long since have recognized the importance of scientific theory to national survival in the atomic age and now far outpace the U.S. in the education of young theoreticians. Teller himself regarded his work at Berkeley as equal to if not greater than anything he ever contributed at Los Alamos or Livermore.

Though Teller was helping contrive a weapon that has revolutionized warfare, he had yet to take his place alongside the giants of his profession who have advanced man's fundamental knowledge of his environment. Teller was working primarily toward that goal. Few of the top-flight scientists who have worked with Teller doubted that he would reach

it. His mind was not only inventive and ingenious but soared easily to conceptual heights.

Teller himself expected to arrive at true knowledge along the path of simplicity. Every layman who has talked with him finds the same predominant characteristic: clarity. The men in government who forced the issue so that the attempt to make the thermonuclear weapon would go forward remember that Teller alone made the whole thing understandable.

This quality of clarity and the search for simplicity underlay his entire approach to theoretical physics. "We are getting too complicated," he told a group of younger scientists. "We have so complicated the interior of the nucleus that we have led ourselves to a blank wall in understanding the true nature of things. We should go back again to the classical theories and work forward anew to see what it is we have been unable to understand."

Teller was very precise about how theoreticians should proceed. He objected to mathematical purists who strove mainly to bring their equations into balance, assuming that a relationship between their mathematics and reality must exist. He objected equally to mathematical grinds who felt that the way to truth lay in endless laborious calculations.

Said one associate recently: "Edward will do only those calculations which can be done in his head. The others he turns over to someone else to put through univac. He loves univac." *

Like most top theoretical physicists, cosmology was Teller's dish of tea. But, curiously, Teller, the idea man, objected most strenuously to a purely conceptual approach even in broad-brush cosmology.

Teller often recalled that an ancient concept of the universe held that the earth was something like the back of a great tortoise astride a crocodile that in turn swam in a pool of

* The univac machine, which accurately forecast the 1952 elections on television as an Eisenhower landslide, only to be disbelieved by its operators.

water carried on the back of an elephant. This primitive cosmology explained most of the observed phenomena of the age and had only one major flaw: it did not explain what the elephant was standing on.

Edward Teller found the modern physicist with his sophisticated knowledge of quantum mechanics, the motions and velocities of mesons and electrons and neutrons, to be in much the same relative condition as the ancient metaphysician. He was still unable to explain what the elephant is standing on.

Not long after the Livermore Laboratory was established, Teller found time to resume a study he had begun at Chicago, in the postwar years when he worked with Enrico Fermi: the distribution of elements. With the help of associates, he collected all observed evidence on the distribution of elements throughout the observable universe. He believed he might be on an interesting trail. He also kept a close watch on the massive observations through the two-hundred-inch reflector at Mount Palomar. As the data was processed on the observations at the extreme range of the "big eye," they were brought to Teller for study.

He refused to jump to a conclusion without thorough testing, both of his evidence and of the hypothesis he might draw from it.

Said Teller to his associates: "I try to teach my children to say they don't know when they don't know."

As the "Ivy" operation, as the new atomic tests were code-named, approached—but much too late to change the nature of the "Ivy" tests—the atomic scientists finally saw their way to an answer to the problem of taking the hydrogen bomb out of the deep freeze. The method has, of course, never been revealed. There are several possibilities; one widely discussed by science reporters in their often authoritative columns was suggested as far back as 1946 by an Austrian physicist, Dr. Hans Thirring: "Another substance which perhaps could be brought to chain reaction by the detonating action of an atomic bomb is a mixture containing lithium and hydrogen,

for example, the compound lithium hydride. At a temperature of several million degrees, the lithium nuclei can react with hydrogen nuclei forming two nuclei of ordinary helium."

Thirring noted that this reaction would release the energy of 17.3 million electron volts, roughly equivalent to the energy release in the reaction involving deuterium and tritium. He added solemnly: "God protect the country over which a six-ton bomb of lithium hydride will ever explode."

Meantime, the Los Alamos Laboratory had completed the "Mike" device for "Ivy" and had shipped it to Eniwetok—on schedule—for testing. In the fall of 1952, a new task force began assembling at the AEC's Pacific test atoll. As at "Greenhouse," there were thousands of men, machines, meters, aircraft, ships, scientists, instruments, Congressional observers, and others. The big blast—the full-scale test of the "Mike" device—was to be fired from a "cab"-enclosed tower on Elugelab, one of the small islands making up the atoll, on November 1.

Teller decided against going to Eniwetok to watch the "Ivy" test. The weather for such a test must be perfect, and it was possible that the shot might be delayed for weeks. He did not think he could afford to be away from Livermore that long while he was working on a completely dry bomb. Through coded telegrams, he was kept informed of the activity on Elugelab.

On November 1, at a prearranged time, Teller took station alongside the seismograph at the University of California in Berkeley. The explosion went off on schedule. It was announced by a sharp zig on the seismic recorder. "Shot" island, Elugelab, was wiped out.* A crater more than a mile wide and 175 feet deep was blasted in the ocean bed. The fireball ex-

* In spite of elaborate security preparations, the nation learned this fact only a few days after the test. Mail was not censored on the ships at Eniwetok. Some sailors wrote their wives, mothers, and sisters, describing the blast in vivid and accurate detail. A few of these eyewitness accounts found their way into the press.

tended, within four seconds, to $3\frac{1}{2}$ miles in diameter. Ten minutes after the blast, "Mike's" mushroom cloud measured 25 miles high and 100 miles wide. "Mike's" destructive blast, more than three megatons (3,000,000 tons of TNT), contained as much force as that in the combined weight of all bombs dropped on Germany and Japan in World War II.

Because he was uncertain of the political reaction to the news of the thermonuclear explosion, coming only three days before the 1952 Presidential elections, President Harry S. Truman—to his great credit—slapped an airtight security lid on everything concerning the explosion of the "Mike" device.

Fourteen minutes after the blast, as he watched the seismograph recording with satisfaction, Teller said to a friend: "That's very nice."

Then he walked to a phone and called Herb York at Livermore Laboratory. In guarded words, which would be meaningless to a listening enemy but which York understood, Teller said that the experiment had been a success. York in turn sent a telegram to some of Teller's friends at the Los Alamos Laboratory, which had no immediate communications with Eniwetok or an adequate seismograph. A prearranged signal, the message read:

"It's a boy."

More than a year later, through the release of the twenty-eight-minute movie, "Operation Ivy," the American people obtained a fuzzy, soap-opera look at "Mike" and what it did to Elugelab. Through this amateurish movie,* and through speeches by Congressman Sterling Cole, Chairman of the

* Los Alamos personnel who supervised the preparation of the movie were careful to see that no scenes included Edward Teller. Some of Teller's friends at Los Alamos had other ideas. During the filming of the so-called staff meeting at which Dr. Bradbury allegedly gave the go-ahead for the bomb, a friend of Teller's clandestinely substituted a picture of Teller for a picture of an A-bomb cloud on the wall behind Bradbury. The particular scene survived final editing and in the released version of the film Teller was identifiable to a few knowing scientists.

Joint Congressional Committee on Atomic Energy, the public learned of "Mike's" fearful power. Said Cole:

If [the explosion] occurred in a modern city, I am told that the heat and blast generated would cause absolute destruction over an area extending three miles in all directions from the point where the hydrogen device exploded. This is an area of complete devastation—using the word "complete" in its most precise meaning—six miles in diameter. The area of severe-to-moderate damage would stretch in all directions to seven miles from ground zero. Finally, the area of light damage would reach ten miles from the point of detonation. In other words, an area covering 300 square miles would be blanketed by this hydrogen explosion.

Chapter 16

THE "CASTLE" TESTS

THE EARTH SHOCK of the "Mike" explosion alerted the world to the realization that the United States had entered the thermonuclear age. With even this clumsy device, the U.S. for the moment could claim a super monopoly in atomic weapons. The nation could find some comfort in this fact, but not nearly so much as it had found in the A-bomb monopoly. The man in the street knew instinctively what the atomic physicist knew positively—that if the Russians could master the A-bomb, they could master the H-bomb, and that it would be only a matter of time before instruments in the free world would pick up earth shock waves originating in the vast wastes of Siberia.

No one knew these facts better, or saw the nature of the desperate race with greater clarity, than the atomic scientists at Los Alamos and Livermore now engaged in an all-out effort at once co-operative and competitive to win. Day and night they worked to complete a transportable, easily manageable thermonuclear bomb. They had no way of knowing their relative position with their Soviet opponent.

Nine months after "Mike," on August 8, 1953, Russian Premier Georgi M. Malenkov made a speech to the Supreme Soviet. He spoke as follows:

It is known that abroad the partisans of war have for a long time cherished illusions of the United States' monopoly in the

production of the atomic bomb. . . . The United States of America has long since ceased to have the monopoly in the matter of the production of atomic bombs. . . . The Soviet government deems it necessary to report that the United States has no monopoly in the production of the hydrogen bomb either.

Malenkov's words startled Washington, Los Alamos, and Livermore. There had been no evidence of a new atomic explosion anywhere in the elaborate U.S. detection system.

Then, four days later, on August 12, the U.S. detection system picked up positive evidence of a Soviet thermonuclear explosion. Through much the same channels that had relayed the secret of the first Soviet atomic explosion, the word of the thermonuclear "Joe One" was passed to Washington. An elaborate effort to obtain radioactive particles from the new explosion was mounted. It succeeded a few days later. It seemed clear that Malenkov had had such great confidence in the success of the Soviet thermonuclear test that he had made the announcement of it four days in advance.

While the free world shuddered at the news of the Soviet explosion, AEC physicists worked day and night to ascertain from the evidence of the Soviet dust cloud just what the Soviets had accomplished in the thermonuclear field. The important question was whether the Soviets were using some form of hydrogen in a liquid state or whether they had come up with some more direct approach to a useful weapon.

When the analysis was completed, the report was quickly passed to the AEC in Washington and to President Eisenhower. It was a sobering document.

The evidence indicated the Soviets had achieved a technically advanced thermonuclear shot and were, in some respects, ahead. They had already accomplished some of the things the U.S. had hoped to do in the tests to be held in the spring of 1954. Just as they had short-cut early U.S. developmental stages in the atomic bomb, they had appeared to bypass the "deep freeze" stage of U.S. thermonuclear development.

The power of the Soviet explosion was estimated by U.S. experts at one megaton (1,000,000 tons of TNT). The Soviet Army newspaper *Red Star* described the thermonuclear blast with exaggeration reminiscent of the terms used to describe the greatest explosion ever witnessed by man: that of the million-ton meteorite that fell into the remote Stony Tunguska * River area of North Central Siberia in 1908.

On receipt of the news, President Eisenhower called the National Security Council into special session, in order to consider the significance to over-all U.S. policy of the Soviet developments. From this point forward, the U.S. would deal with a Soviet Russia armed with the same predominant weapons the U.S. hoped to possess.

Added to its heavy superiority in conventional weapons, the hydrogen bomb would one day make the Soviet Union a threat not only to Europe and Asia but to the entire world. With the news of the Soviet thermonuclear explosion, Dwight Eisenhower became the first President to have to face the fact that the United States could be destroyed by an enemy.

During the first days of evaluating the significance of the latest news from the U.S. atomic detection system, two questions were uppermost in the President's mind: (1) How long would it take the United States to produce a droppable bomb? (2) Were the Soviets yet in a position to wage thermonuclear war, or to enforce their will on the free world by thermonuclear ultimatum? The answer to the first question was supplied by the new Chairman of the AEC, Lewis Strauss: seven months. The answer to the second, as given by the Central Intelligence Agency, was that the Soviets would *not* be in the

* Stony Tunguska is generally considered to be one of the largest meteorites ever to penetrate the earth's atmosphere. It was estimated to have entered the atmosphere at a speed of 37.28 miles per second; it caused a blinding flash that was visible for about 380 miles. The explosion was heard over an area hundreds of miles wide; seismographs recorded its earth-shaking force at many stations. Trees were blasted from their roots over hundreds of square miles of Siberian taiga, the vast, swampy coniferous forest region of Siberia.

years 1953 or 1954 in a position to wage thermonuclear war. They had neither the required force of long-range jet bombers nor a sufficient stockpile of bombs.

There was another important question to be settled. Should the American people, and their allies in the free world, be told that the Soviet Union had now outmatched the West in a technical race for the thermonuclear bomb? It was a question that was not easily answered. One group of top atomic policy makers, led by the Chairman of the Joint Committee, Sterling Cole, urged that the American people be given the facts. Another faction of the government, led by AEC Chairman Strauss, argued against revealing the secret.

The White House failed to resolve the issue at first. The result was more confusion in Washington. Top government officials began to assess the facts of life in the thermonuclear age. Defense Secretary Charles E. Wilson had been laboring to reduce military expenditures, so he assured the nation the "Russians are not ten feet tall." Civil Defense Administrator Val Petersen found it almost impossible to get any kind of program underway even to mitigate the disaster of a surprise hydrogen attack, so he sounded a ringing alarm. However, the most revealing statement of the period came from Chairman Cole: "The Russian H-bomb can be delivered by air—that's why I am so disturbed and troubled."

It was lost in the confusion that continued to mount. Finally President Eisenhower himself acted to put an end to the ill-considered babble of atomic misstatements. No member of his administration would in the future speak on atomic matters until his statements had first been cleared with AEC Chairman Strauss. With one or two early exceptions, the order took hold.

The fact seemed to be that the Soviets—as Lewis Strauss stated in a speech—had started work on the thermonuclear bomb much in advance of the U.S. and had simply accumulated a big head start. In 1949, while Washington debated whether or not to launch a thermonuclear program as a result of "Joe One," the Soviets were plugging away on their own

thermonuclear program and had amassed a dangerously long lead.

By now, nuclear physicists throughout the nation were alert to the danger, and the maximum effort went into the U.S. thermonuclear program. Both AEC weapons laboratories, Los Alamos as well as Livermore, were fully mobilized for the job. There was ample work for both, and the scientists at both did their utmost. Los Alamos made the greater contribution.

On March 1, 1954, the first prototype of a U.S. droppable bomb exploded at Eniwetok as part of "Operation Castle." The bomb was shot from a tower in order to obtain more accurate measurement data. The enormous blast, estimated at about 750 times the power of the Hiroshima atomic bomb, became famous prematurely because an unexpected wind shift showered a wandering Japanese fishing boat with radioactive ash with the result that a group of Japanese fishermen manning the vessel became the world's first, if nonfatal, casualties of a thermonuclear bomb.

The Japanese ship was named the *Fukuryu Maru* (*Fortunate Dragon*). On the morning of March 1, 1954, the *Dragon's* youthful skipper, twenty-four-year-old Tadaichi Tsutsui, dropped anchor and cast nets at 5:30 A.M., at a position 71 miles east-northeast of Bikini atoll (165 miles from Eniwetok). The ship was 14 miles outside the restricted area of the U.S. Atomic Energy Commission's Pacific Testing Grounds.

Sunrise came at 6:09. As the haze burned off the Pacific, the visibility became excellent. A calm sea was running, just enough to put a gentle roll under the hull of the ninety-ton fishing ship. Tsutsui and his eight crewmen hauled in their nets brimming with tuna, bringing to more than 16,500 pounds the catch in the boat's hold.

The time was 6:12. "Then," one of the crewmen, Sanjiro Masuda, said later in an interview with *Life* correspondent Dwight Martin, "we saw flashes of fire, bright as the sun itself, rising into the sky. They rose about ten degrees from the horizon and the sky around them glowed fiery red and

yellow. Someone yelled to the men below, 'The sun is rising in a strange fashion. Hurry up and see it.' Then I realized that what we were watching could not be the sun, for the light was coming from the west. It was at this moment that I first felt fear and first thought of *pikadon*." *

The glow continued for several minutes—two or three as Masuda recalls. "Then," he continued, "the yellow seemed to fade away, leaving a dull red, like that of a piece of iron cooling in the air."

The sounds of the explosion came about six minutes later. "There were two of them," Masuda said, "and they went *do-kan*, like the sound of many thunders rolled into one. We felt no concussion, although the ship did seem to roll to starboard. It was as if she were trying to ward off some blow." Then a pyramid-shaped cloud began to form. How high it went, none of the fishermen knew, said Masuda, because none could see its top as it billowed up and up into the sky. Those who watched do not agree on the color of the cloud. Masuda says it seemed to change "many times." Some swear it went through a series of strange bursts and flashes that included nearly every color in the spectrum—red, orange, violet, greenish-blue.

The colors gradually faded, and the sky was cleared again. "Against the sky," said Captain Tsutsui, "a trailing thin cloud appeared. I recall Saburo Ando saying, 'Look, a con trail.† I wonder if it could be an atom bomb?'" But the fishermen returned to their nets.

They worked the nets for a while—Masuda remembers it

* Before Hiroshima and Nagasaki, the Japanese had no such word as *pikadon*, although *pika* had long been used as a colloquial word for "flash." *Pikadon* is what the Japanese came to call the atomic bomb, with a sharp accent on the *ka*, a pause, then *DON*, brought out like a drumbeat or thunderclap.

† The standard world-wide contraction of condensation trail, the long white streak that streams behind jet airplanes. It is caused by the heat of the jet tail pipe condensing water in the air.

as three hours, Captain Tsutsui as two hours. The catch was good.

Then a fine white dust, or ash, began to fall. "Some ash fell in my eyes and began to burn," Captain Tsutsui said. "Then the ash got in my nostrils. I blew my nose and took off my straw hat and tried to brush the ash away and off myself."

The ash was fine, like talc. Masuda said, "When the first clouds from the explosion began to come over us, just before the rain of ashes began, the real sun in the east was obliterated. We looked in the direction of Kwajalein; it seemed completely enveloped in dark clouds.

"There was another curious thing. I was wearing a pair of cotton gloves, tied to my wrist with rubber bands. When I put the gloves on, before the ash fell, the rubber bands seemed strong and springy. But when I took them off, they crumbled and came to pieces.

"I remember that shortly before I entered the engine room for my bath after the ashes fell, I felt much warmer than usual, almost as though I were glowing, and that several others remarked that they felt the same way. Again we paid little attention to this because we are so used to sunburn and wind burn."

But Captain Tsutsui was getting more and more uneasy: "I thought: 'The bomb tests were being conducted over coral reefs. It could be pulverized coral ash, couldn't it?'" He ordered the crew to up anchor. The trawler steamed for home, 2,000 miles away.

Fourteen days later, the ill-fated vessel arrived in Japan. By then most members of the crew were ill. After the ship berthed, the sick sailors were quickly transported to a special hospital ward for treatment. When the crew revealed that they had become ill near Eniwetok, Japanese atomic-radiation specialists were called in.

Before the *Fortunate Dragon's* cargo of tuna could be impounded for inspection, much of it had been taken ashore in

Japan and sold. When it was discovered that the men, the boat, and the cargo of tuna were "hot" with radioactivity, Japan reacted sensationally. The resultant campaign to track down and destroy the *Fortunate Dragon's* tuna cargo touched off one of the biggest flash scares in Japan's history.

The news stories of the *Fortunate Dragon*, coupled with a news report from the U.S. Atomic Energy Commission to the effect that 236 natives and 28 American personnel manning a weather station 80 miles from "shot" island had also been subjected to fall-out touched off a second round of thermo-nuclear confusion in Washington. Some officials, unfamiliar with fall-out, had erroneously concluded that the actual blast of the bomb had extended over an 80-mile radius. One Congressman declared that the bomb had "gone out of control."

President Eisenhower and AEC Chairman Lewis Strauss held a joint press conference in an effort to put the March 1 blast into proper perspective. Chairman Strauss said:

"The first shot has been variously described as 'devastating,' 'out of control,' and with other exaggerated and mistaken characteristics. I would not wish to minimize it. It was a very large blast but at no time was the testing out of control. The misapprehension seems to have arisen due to two facts. First, that the yield was about double the calculated estimate—a margin of error not incompatible with a totally new weapon. Second, because of the results of the fall-out."

After explaining how the fall-out had drifted from clouds onto the Japanese fishermen, natives, and U.S. personnel, Strauss got into a question-and-answer exchange with reporters—an exchange memorable for its substance and for its tone of understatement.

A REPORTER: "Many people in Congress, I think many elsewhere, have been reaching out and grasping for some information as to what happens when the H-bomb goes off. . . ."

STRAUSS: "Well, the nature of an H-bomb is that, in effect, it can be made to be as large as you wish, as large as the

military requirement demands, that is to say, an H-bomb can be made as—large enough to take out a city."

CHORUS: "What?"

STRAUSS: "To take out a city, to destroy a city."

A REPORTER: "How big a city?"

STRAUSS: "Any city."

REPORTER: "Any city? New York?"

STRAUSS: "The metropolitan area, yes [i.e., Manhattan, he later elaborated]."

The responsibility of informing the American people of the real significance of the March 1 Eniwetok test was assumed by Joint Committee Chairman Sterling Cole. Without drawing attention to his statement seven months earlier following the Soviet thermonuclear explosion (in which he said the Soviets had a droppable bomb), Cole said:

"We have passed another milestone. We now have a deliverable hydrogen weapon that can be dropped anywhere in the world."

The March 1 shot had been expected to reach about twice the force of "Mike," 7 megatons (7,000,000 tons of TNT) or perhaps exceed it. Actually, as Strauss points out, the scientists miscalculated. It exploded with the incredible force of 15 megatons.

The task-force commander planned to follow the March 1 shot with a supergiant of all atomic bombs, which originally had been assigned a predicted force of 15 megatons. The new calculations pushed the giant bomb near the practicable limit of thermonuclear weapons, 45 megatons, 2,400 times the force of Hiroshima. The schedule of the tests was changed to put it last. The probability was that its mighty fireball and shock wave would destroy the entire chain of advance camps between Eniwetok and the "shot" island.

Then at the last minute the task-force commander and Atomic Energy Commissioners decided that the bomb could not be fired without unacceptable risk to ships at sea and Marshall Island natives. It was postponed for a later test in a

greater expanse of the Pacific. But in the global competition of the scientists, where results are read on seismographs and dust samples, the Soviets were advised in March and April, 1954, that the qualitative score was again even.

PART THREE

Chapter 17

AIR POWER AND SCIENCE

THE WEAPON CONSTITUTES only one half of the atomic-deterrent force. Equally important to the nations of the free world, and equally as complex from a technical standpoint, is the means employed to deliver it. At the halfway mark of the twentieth century, the United States depended on large fleets of conventional and jet-powered, piloted bombers to project its atomic retaliatory power across the seas. The bombers were massed together along with supporting forces in a special, elite organization called the Strategic Air Command.

The military doctrine of Strategic Air Bombardment, or the use of large fleets of bombers to destroy a nation's factories, mines, steel mills, and population centers, in order to break its will to wage war, was first postulated by an Italian air-power theorist named Giulio Douhet. World War II provided the real test of his theories, which, during the thirties, had been expanded and elaborated upon by most of the world's air forces. The Allied nations formed huge bomber forces and systematically destroyed the urban and manufacturing centers of Germany and Italy, contributing heavily to their defeat. The weapons system reached its technical climax when the U.S. dropped two atomic bombs on Japan, killing several

hundred thousand civilians in Hiroshima and Nagasaki and bringing about the capitulation of Japan within two weeks.

The technology of strategic bombing advanced rapidly during World War II. Before the end of the war, Nazi scientists provided Hitler with a means of carrying out strategic bombardment, without the need for expensive pilots and relatively slow, vulnerable bombers. The innovation was, of course, the German V-2 rocket. The V-2, a pencil-shaped missile, 46 feet long and 5½ feet in diameter, with a range of several hundred miles, traveled at a speed of 3,466 miles per hour. More than 12,000 Germans, including 1,500 scientists and technicians, and 8,000 special workers were engaged in development work on the V-2. Tens of thousands of workers were engaged in the manufacture of the lethal weapons.

All in all, more than 12,000 V-2 rockets were manufactured by the Nazis. Some 4,300 V-2's were actually fired against the Allies. London and Antwerp bore the brunt of the attack. Of the 2,000 rockets that crossed the English Channel, 1,230 smashed craters in London itself. The Nazis were on the point of developing a rocket that could cross the ocean when the Allies overran their rocket development center at Peenemünde.

After World War II, the U.S., with large heavy bomber fleets in being, and proud pilots at their controls, unfortunately ignored certain obvious implications of the Nazi technological advances. In one of the truly grave military mistakes, guided-missile research was largely confined to the simple test firing of 75-odd captured German V-2 missiles, plus unorganized low-priority development work. The power to wage strategic air warfare, which had, in the eyes of many, become the "ultimate weapon" with the atomic bomb, was confidently relegated to the rapidly aging bomber fleets.

The Strategic Air Command, or SAC, set apart from normal military channels in that it was ordered to report directly to the Joint Chiefs of Staff, became the core of U.S. military striking power. From 1946 until 1949, SAC gradually de-

generated into a second-, and then third-rate, military force. Its World War II bomber, the B-29, was replaced not by long-range pilotless missiles, but by more conventional-powered bombers, the B-50, and later a bomber with intercontinental range, the B-36. SAC's pilots, who flew only ordinary routine cross-country flights, grew lax and lazy, "just boring holes in the air," as one airman put it. The effectiveness of SAC was further reduced (along with other military components) when Harry Truman and Louis Johnson slashed the Air Force to forty-eight wings in 1949.

"Joe One" underscored the inadequacy of SAC. Now that the Soviets had broken the monopoly on atomic weapons, the U.S. could maintain its freedom only by making it clear to the Soviets that an atomic attack on the West would be met by instant and devastating atomic retaliation carried out by the Strategic Air Command. SAC could not bluff its way. SAC would have to be capable of delivering such an attack.

Shortly after "Joe One," the Air Force faced up to the need of a revamping of SAC. It began by assigning SAC a new commander, one of the toughest, most uncompromising in U.S. military history: General Curtis E. (for Emerson) LeMay. LeMay, one of the leading authorities on strategic bombing, received orders from Air Force Chief of Staff General Hoyt Vandenberg to recast SAC into a tightly knit, tough, fighting force. Its equipment, its men, and its training must all be of the finest obtainable.

Cigar-chomping Curtis LeMay began his task with enthusiasm and the sort of single-mindedness that had marked his military career since he had gone through Ohio State ROTC and become an Air Force officer in 1928. While his classmates swooped off for weekends, LeMay, no comic-strip fly boy, hung back to take engines apart, work at machine guns, pore over weather charts and navigation logarithms. After seven years in fighters, he was called from Hawaii to fly the first of the Army's Flying Fortresses because he was the rare Army airman who could find his way around with a navigator's

sextant and chart. From then on his career was set as a big-plane man.

In World War II, he became a legend—a brigadier general at thirty-six, a major general six months later. In England, LeMay decided that too many of his B-17's were missing enemy targets because they zigzagged out of the way of heavy antiaircraft fire. He clamped a cigar in his jaw, led the next raid over Saint-Nazaire, and held his plane on course up to the bomb drop through a murderous ack-ack for a grim seven minutes. Next day he issued a flat order: no more evasive action on the final bombing run. Plane damage went up, but results went up more.

In the Pacific, where he ran the 300-plane B-29 raids against Japan, he suddenly pulled the high-tailed bombers down from the clouds, took out their guns and gunners, and overloaded them with fire bombs to dump on Japan from low level. It was a risk that could have wrecked an air fleet and a career, but it caught the Japanese off guard and ripped Tokyo and three other industrial centers as devastatingly (over a period of ten days) as the atom bomb tore up Hiroshima.

Less than three years after the peace, when everyone else was loosening up his military girdle, LeMay found himself running the Berlin airlift as Chief of U.S. Air Forces in Europe. One day a C-54 pilot at Frankfurt felt a heavy hand on his shoulder and looked up into the Old Man's three stars: "Son, I'll take this load," said LeMay. "Go and tell your dispatcher—and if he lets the other end know I'm coming, he'll get hell from me." LeMay flew into Berlin, unloaded, then took his place in the take-off waiting line for forty minutes.

Back in Frankfurt, he buzzed for his staff. Said he: "Get it fixed. I will expect airplanes to be taking off five minutes after they have unloaded—by day after tomorrow." Three days later he dropped in again. "O.K. it's fixed," he grunted. "See if you can better it."

After taking over SAC, LeMay looked over the equipment

at his disposal and shuddered. It was clear to him that years would elapse before the U.S. could achieve adequate intercontinental missile delivery. Accordingly, LeMay ordered that SAC be equipped with jet-powered aircraft, an expensive—but necessary—interim step. First, he ordered four jet engines placed on the B-36 to give it faster speeds over target; next, he ordered the B-47, medium-jet-bomber program speeded. He urged Air Force headquarters to hurry along the planned intercontinental jet bomber, the B-52.

Turning to his men and their training, LeMay reorganized SAC completely, putting it on a “twenty-four-hour-a-day alert.” Guards and inspectors were ringed around SAC bases. Crews were ordered to fly mock bombing runs on Russia. The communications and command headquarters was moved from Washington to Offutt Field in Omaha, Nebraska.* Soviet target systems were completely overhauled. LeMay began construction of a network of overseas bases; then he began demanding more atomic bombs.

Under LeMay, SAC, a controversial outfit from the moment it was founded, became even more controversial. Many Army and Air Force officers, disciples of the “tactical” school, who believed a nation’s air striking power should not rely exclusively on strategic bombing, resented the fact that LeMay and SAC were draining off most Air Force procurement and operational funds, leaving practically nothing for air defense and tactical aviation. The Navy, which had been excluded from a role in the Strategic Air Retaliation System (and hence atomic weapons) through the institution of SAC, was jealous of LeMay and his big bombers.†

Moreover, the doctrine of strategic bombing itself has never

* When LeMay arrived in Omaha, the town tingled. A local reporter asked LeMay what the move would mean to Omaha. Growled LeMay: “It doesn’t mean a damn thing to Omaha and it doesn’t mean a damn thing to me.”

† In October, 1949, this jealousy reached a climax when the Navy launched an attack on the Secretary of the Air Force, the B-36, and the doctrine of strategic bombing, which resulted in the famous B-36 hearings before the House Armed Services Committee.

been unanimously accepted by students of military strategy. Many have argued that World War II strategic-bombing results in Germany and Japan did not justify the effort, that the Nazis and Japanese military forces were destroyed largely through the use of large land armies and sea blockade. They say the atomic bombs dropped on Japan were superfluous, that Japan was already beaten. Naval strategists, in particular, arguing that the U.S. ought to maintain a flexible strategy, objected to "putting all the eggs in one basket," as they described the strategic-bombing concept. Others objected to the basic doctrine of strategic bombing, the destroying of population centers, in order to break a nation's will and capacity to make war.

The nuclear physicists, who had organized after the end of World War II to expiate the "sin of Los Alamos," to wrest the atomic bomb away from the military, give its secrets to the world, and bring an end to all wars, were especially annoyed by the specter of SAC. They believed that, by generating fear in the Kremlin, it served as a goad to Soviet development of counteratomic weapons. They argued that SAC aroused certain misgivings among our allies and that a renunciation of atomic-offensive power by both major adversaries—the U.S. and the U.S.S.R.—was essential to the easing of world tensions. If the U.S. maintained military forces at all, they believed they should be primarily defensive and not offensive in character.

Early in the game, SAC and the concept of strategic bombardment came under as vigorous an attack as the atomic bomb itself by these self-styled military strategists. In addition to advancing the defensive concept and attacking SAC, the scientists, in the belief that the military were incapable of dealing intelligently with them, attempted to wrest all military research and development from their control.*

* They did not succeed. However, by drastically curtailing research and development funds, the scientists reduced the Air Force fighter-development program to a dribble. For three years prior to Korea, no new prototypes appeared.

This campaign was disconcerting to the Air Force on many grounds, but primarily because the Air Force believed the nuclear physicists to be largely ignorant of air power. The scientists were acknowledged experts on radar, electronics, sonar, proximity fuses, and atomic bombs. But few scientists—and no nuclear physicists—engaged directly in the design and fabrication of aircraft and aircraft accessories during World War II. Aircraft were produced entirely by the aircraft industry. Air Force generals liked to tell the story of how one nuclear physicist worked eight fruitless months on the control system of a guided missile, only to be shown that all that was needed was two more square feet of tail surface.

Through the postwar years, as a result largely of emphasis on SAC and infrequent contact between airmen and scientists, a barrier grew up between some of the nuclear physicists and the Air Force. The appointment of Curtis E. LeMay, who was dedicated to building SAC into the most powerful military force in the world, further aggravated the scientists. The harder LeMay worked, it seemed, the harder the scientists worked against him. Thundering, "Give me more bombs; give me more powerful bombs; then stand out of my way, Moscow," LeMay struck terror in the hearts of those physicists who advocated what amounted basically to a "defensive" concept.

In spite of SAC's growing capability under LeMay, "Joe One" and the appearance of the Soviet MIG-15 made it obvious that the United States Air Force and, hence, the U.S. would be destroyed in a technical race with the Soviets, if it did not somehow enlist the aid of U.S. science. The jet engine and the swept-back wing, plus other new developments, were causing a technological revolution in air power. The "wire and fabric" Air Force commanders realized the barrier existing between the scientists and the Air Force must be broken down.

Air Force Chief of Staff Hoyt Vandenberg began the campaign to destroy the barrier by enlisting the services of

an eminent U.S. scientist, Dr. Louis N. Ridenour, whom he appointed "Chief Scientist" of the Air Force. Ridenour's job was twofold: to direct the overhauling of the Air Force research and development programs—a vast disarray of hundreds of projects scattered around the United States in scores of locations, manned by tens of thousands of technicians, fraught with duplication, waste, and boondoggling. In addition, he was asked to try to establish contact between the scientific community and the Air Force in order to recruit the services of these men for crucial Air Force projects. Ridenour told a friend: "I'm going to be the Van Bush of World War Two point seven."

To handle the immensely complex job of overhauling U.S.A.F. Research and Development, Vandenberg and Ridenour succeeded in obtaining the services of Lieutenant General James E. ("Jimmy") Doolittle, the famous airman who led the first bombing raid on Tokyo. To try to break the barrier between science and the Air Force, Ridenour formulated a policy of asking for their assistance, in the belief that if they worked with the Air Force they would grow to understand it and approve of its doctrine. Accordingly, Ridenour, with the help of Dr. Ivan A. Gettings, Chief of AF Development Planning, organized a series of large-scale scientific studies of Air Force equipment and theories of war.

Because of the concentration of Air Force funds in SAC, in the belief that an offensive strategy outweighed a defensive strategy, the air defense of the United States was virtually nonexistent at the time of "Joe One" in September, 1949. No office in the Air Force was labeled "Air Defense." Ridenour, an ardent SAC proponent, believed it imperative that air defense be improved, and therefore he directed that the first scientific study be conducted on that phase of air power.

Ridenour contacted an M.I.T. physicist named Dr. George Valley, Jr., who had previously indicated an interest in carrying out a survey of the U.S. Air Defense System. This contact ultimately led to the creation of a secret M.I.T. air-defense

study named "Project Charles." The study confirmed the Air Force belief that, with the atomic bomb in Russian hands, air defense had become a matter of extreme urgency, and it recommended an immediate program to fill the need.

Part of the recommended program was the establishment of a huge air-defense laboratory, to do for air defense what the Los Alamos Laboratory did for the atomic bomb. Eventually such a laboratory was established at Cambridge, Massachusetts, under the supervision of M.I.T.'s President Dr. James R. Killian, Jr. With a staff of 1,600, including 350 full-fledged scientists, and an annual budget of twenty million dollars, a budget twice the size of M.I.T.'s entire undergraduate teaching program, the organization was named the Lincoln Laboratory. Its study of U.S. air defense was named "Project Lincoln."

Next, Ridenour turned to the badly sagging Tactical Air Force. He instituted a study of tactical warfare, with emphasis on the use of tactical atomic weapons, with particular reference to the defense of Western Europe. The study, broadened to include Army and Navy roles, was named "Project Vista," and was undertaken for the armed services by President Lee DuBridge of the California Institute of Technology.*

Meantime, Stuart Symington, former Secretary of the Air Force, then head of the National Security Resources Board, a government agency charged with surveying the nation's needs in event of full-scale mobilization, expressed a desire to initiate a "Vista"-like study of U.S. civil defense. Ridenour agreed to make the study a joint NSRB-Air Force study, and immediately approached Killian and asked if he would take on the job. Killian, already overloaded with "Project Lincoln," turned it down, and the study was given to Dr. Lloyd V. Berkner, of Associate Universities, Inc., an AEC-sponsored research organization. The civil defense study was named "Project East River."

* A member of the AEC General Advisory Commission, who, with Oppenheimer, voted against the H-bomb program.

Next, Ridenour turned to the Strategic Air Command, on which the fire of both scientific and military critics of the Air Force had centered. But what scientist would undertake this controversial survey? Ridenour decided to ask the man the Air Force considered to be the prime critic of SAC, Dr. J. R. Oppenheimer, to undertake the study. Ridenour hoped that by naming Oppenheimer to make the study, Oppenheimer would learn something of SAC's importance to the defense of the nation, and that, having learned that, he would put an end to the "sniping" and campaigning against SAC. "At least after that," Ridenour told a friend, "it would be 'informed sniping.'"

One rainy Saturday in the summer of 1951, Ridenour climbed in an airplane and flew up to Princeton to see Oppenheimer. After circling Princeton for three hours trying to land, Ridenour finally got on the ground at Trenton and made his way to the Institute for Advanced Study at Princeton. Oppenheimer agreed to undertake the survey.

The move to appoint Oppenheimer to head this survey was abandoned in the fall of 1951, after General Pete Quesada returned from "Greenhouse" with reservations about Oppenheimer and his activities, which he made known to Vandenberg and the Air Staff.*

Thus was set in motion, after "Joe One," a vast scientific overhauling of the Air Force. Ridenour initiated other studies. One covered all phases of meteorology. Another dealt with nonatomic aircraft armament. All the studies were aimed primarily at mobilizing science for the benefit of the Air Force.

* After hearing of Quesada's concern about Oppenheimer, Vandenberg retorted: "You should go to the White House and tell the President you believe Oppenheimer is a spy." Quesada had not said he believed Oppenheimer was a spy and, on the contrary, had specially not impugned his motives. Quesada immediately suspected that Vandenberg, with whom he was having personal difficulties, was trying to "mousetrap" him into making a loose charge to the President that would have the result of ending Quesada's career. He did not go to the White House to talk about Oppenheimer on any grounds.

The scientist, ordinarily ignorant of and hostile toward air power, was suddenly immersed in air power up to his neck.

The result of this immersion is actually a curious story. The Air Force received immense stimulation from its contact with the scientists and obtained many helpful ideas.* But the Air Force got more than it bargained for. Many of the scientists, who apparently never got over their distaste for the Strategic Air Command, used the Air Force studies to wage doctrinaire warfare against SAC.

The cast of characters among the scientists was constantly shifting, as the Air Force progressed from study to study. But the general underlying theme of minimizing the role of the Strategic Air Command, in favor of this or that doctrine (air defense, tactical), prevailed. It seemed to many top airmen as if some U.S. scientists, unable to stop Teller and his hydrogen bomb, seized on the invitations to study the Air Force as an opportunity to make political war against SAC.

And moving from group to group, uninvited by the Air Force but usually present in the background, was that extraordinary man, J. R. Oppenheimer.

* But the primary contribution to Air Force striking power was made by H-bomb developer Edward Teller, who was never directly connected with any of the Air Force studies.

Chapter 18

“VISTA,” “EAST RIVER,” “LINCOLN,” AND ZORC

THE FIRST ATTEMPT on SAC came during “Project Vista,” operated by the California Institute of Technology. “Vista’s” charter encompassed two military areas: (1) a survey of the effect of atomic weapons upon the art of ground warfare generally; (2) an analysis of the impact of new weapons on the strategy for the defense of Western Europe. Cal Tech’s President Lee DuBridge turned over most of the details of the study to his deputy, Dr. Charles Lauritsen, and Dr. Robert Bacher. The Cal Tech task force was reinforced by more than a hundred scientists from other universities, in addition to a number of tactical-warfare specialists.

One of these specialists was Air Force General Quesada, who, after his retirement, had taken a West Coast house in Los Angeles. An official of Olin Industries, later a vice-president of Lockheed Aircraft Corporation, Quesada was active in scientific research and especially in areas dealing with guided missiles and atomic weapons. A former tactical aviator, Quesada was a logical recruit for “Project Vista.” But he had not been engaged in the project very long as a consultant before he became extremely apprehensive about certain lines

of argument the survey was taking with respect to the use of tactical atomic bombs.

Quesada was saturated with the arguments over strategic vs. tactical use of atomic bombs. Following the successful test of the fractional-crit bomb and the other technical strides that were made in 1951, it had become obvious to a few men in the high levels of the Air Force that there would eventually be more than enough atomic bombs to fulfill SAC's requirements. A great many would be left over for "tactical" use on the battlefield. There arose within the Air Force a movement to draw up a doctrine and provide equipment for battlefield use of the atomic bomb.

LeMay and his SAC commanders, solidly imbued with the concept of a scarcity of atomic bombs, were unwilling to believe that a revolution had occurred. They refused to hear of the tactical use of the bomb. In 1951, a young Air Force colonel drew up a staff study describing the "Atomic Plenty" and how it would make available bombs for tactical use.

One afternoon, at SAC headquarters in Omaha, the colonel stood before LeMay's horseshoe-shaped briefing room table and began reading the paper. Before he had read many lines, LeMay snapped: "That's stupid. It's crazy."

The colonel held his tongue as LeMay delivered his tirade. At length, he asked: "May I finish reading the paper?" LeMay reluctantly consented.

As the colonel outlined the reasons for the revolution in the atomic field, and why the U.S. Air Force should gear itself for widespread use of the atomic bomb—not exclusively in strategic bombing—LeMay turned beet red. When the colonel finished, LeMay said of him:

"He ought to be locked in a box and dropped in the bottom of the sea."

It was obvious that SAC's commander did not intend to relinquish willingly any of his bombs for tactical use. When it was finally proved to him that a revolution had actually occurred in the atomic-weapons field that would yield almost

unlimited numbers of atomic bombs, LeMay still did not concede that some bombs ought to be made available to the Tactical Air Forces. Instead, he tripled his own requirements. "Before LeMay would relinquish one bomb," said one critic, "he wanted to see the Soviet Union destroyed three times."

Such dogmatism created ill-will in high Air Force circles and led to a major clash between the Tactical-Air-Force advocates and the Strategic-Air-Command zealots. Some tactical men could not conceal their feelings. When Major General Gordon Saville, who commanded Tactical Air Forces in the World War II invasion of southern France, took over as Deputy Chief of Staff of the Air Force for Development, he called in a score or more of his subordinates, read them off in memorable fashion, then, pounding on his desk, shouted: "The Air Force is going to have a tactical atomic capability or else."

Other strong Tactical-Air-Force advocates like General Quesada were more restrained in their views. Quesada, for example, hoped that the Air Force would have a tactical atomic capability someday but, nevertheless, believed strongly in the Strategic Air Command and its doctrine. Quesada thought that the correct answer probably lay in a balance between SAC and the Tactical Air Forces, but that for a long time Tactical Air Command should not be given an overwhelming preponderance of the weapons.

It was this belief that led to Quesada's fears about "Project Vista." He learned that certain portions of the "Vista" project, reaching far beyond the contentions of even the most ardent tactical-atomic-bomb enthusiasts, were going to recommend that tactical atomic forces, in combination with relatively small ground forces, would themselves be sufficient to hold Western Europe against the Red Army. On the strength of this hypothesis, Quesada learned, the "Vista" report was going to propose that a substantial part of the existing small atomic stockpile be diverted from SAC to the direct support of the ground battle (one-third for SAC; one-third for TAC; one-third in reserve). Moreover, the report was scheduled to

recommend that, if war were to come, the U.S. should announce that it would withhold SAC from action.

Quesada got in touch with friends in the Air Force, and urged that they hurry out to California to try to head off these recommendations, which were clearly damaging to SAC. On Armistice Day, November 11, 1951, Air Secretary Finletter's two special assistants, Garry Norton and Bill Burden, plus several Air Force officers, arrived at Cal Tech for a conference with Lee DuBridge and Charles Lauritsen.

The Air Force men and scientists closeted themselves in a room behind locked doors and began to go over the report. Norton and Burden discovered that the damaging parts of the survey were contained in one chapter, number five. The introduction to the chapter, they learned, from DuBridge, Lauritsen, and Bacher had been written by none other than Dr. J. R. Oppenheimer. As Finletter's two assistants read the chapter, they took copious notes.

Oppenheimer's assumption seemed to be that if the Kremlin knew that its cities would be spared in time of war, it would spare those of Western Europe and the U.S. This mutual forswearing of strategic air warfare would, in a “Vista” phrase, have the effect of “bringing the battle back to the battlefield.” “Vista's” central proposition—that short-range tactical air forces could check the Red Army at the gates of Europe—had two unstated but obvious corollaries. One was that SAC was no longer essential to national survival. The other was that its replacement by short-range air forces limited to offsetting other military forces would lift from the world the fear of an insensate trading of mass-destructive weapons.

There was obviously much in “Vista” that could be militarily feasible when atomic weapons became relatively plentiful. But the Air Force read Oppenheimer's chapter as a brief for disarming the nation's strongest weapon—SAC—while the Red Army and its tactical air forces otherwise still held the military balance of power in Europe. By the time Norton

and Burden were ready to return to the Pentagon, the Oppenheimer chapter of "Vista" had been withdrawn and destroyed.*

Secretary of the Air Force Finletter was greatly disturbed when he received a report from Norton and Burden. Moreover, he suspected that the delay of the H-bomb was not unrelated to the "Vista" theory. He and Dr. Oppenheimer had a talk in the Pentagon. In their discussion, the scientist questioned the morality of a strategy of atomic retaliation. Finletter answered: "The greater immorality would be for the U.S. to discard its strongest weapon while conditions for world disarmament are still absent."

No official records were kept either of the controversial Oppenheimer chapter of "Vista" or of the conversations between Finletter and Oppenheimer later in the Pentagon. However, Oppenheimer's ideas of the time are to be found in an article entitled "Comments on the Military Value of the Atom." Oppenheimer relied heavily on and quoted at length from the testimony of Admiral Ralph A. Ofstie, who had emerged in the B-36 hearings as an implacable foe, not only of the Air Force and the heavy bombers, but finally of the atomic bomb—which gave the B-36 its punch—as well. Oppenheimer's reliance on Ofstie's testimony at these hearings to appraise the "military value of the atom"—especially since he quoted no other military authority—was akin to evaluating the "military value" of Secretary of the Army Robert Stevens from the testimony of Roy Cohn. Oppenheimer wrote:

Insofar as the prospect of such [strategic] use may be a deterrent to the initiation of war, or an inducement to governments to carry out policies which we think are sound, and in our interest, it is a fine thing. But the question arises: "What happens if the fighting starts? What sort of an instrument is this in real

* Edward Teller sought to get the "Vista" group to contemplate the enormous tactical uses of the hydrogen bomb. It was disposed of in a single brief and casual paragraph.

war? At a time when so very much of our uncommitted military power is in the form of atomic weapons, it is a question that is dangerous not to face. It is not a new question. It has been asked before.

I have thought that I could do little better than quote comment on strategic bombing from the hearings held in October of 1949 before the Armed Services Committee of the House in connection with the so-called B-36 program. In these hearings, there were many debates about whether the B-36 could ever reach its target, and many debates about whether, if it did, the bombardier could hit the target. From time to time, the argument took on a more general character. Here are some fragments of the testimony of Admiral Ralph A. Ofstie, who is now in a Pacific Command, who was at that time a member of the Military Liaison Committee to the Atomic Energy Commission.

Admiral Ofstie first said what he meant by Strategic Bombing. . . . Then, speaking for himself and “many senior officers in the Navy,” Admiral Ofstie says: “We consider that strategic air warfare, as practiced in the past and as proposed for the future, is militarily unsound and of limited effect, and is morally wrong, and is decidedly harmful to the stability of a postwar world.” . . . Much of what was clear to Admiral Ofstie then has become clear to all of us today.

Sensing defeat in the Pentagon, Oppenheimer, DuBridge, and Lauritsen now sought the support of the man charged with the defense of Western Europe, General Dwight D. Eisenhower. Early in December, 1951, the group started out for NATO headquarters in Europe with the “Vista” report in hand.

Fearful of the effect of a man as persuasive as Oppenheimer on Dwight Eisenhower, the Air Force issued emergency orders for the return to Washington of its brilliant, personable commander in Europe, General Lauris Norstad. Norstad was quickly briefed on the “Vista” report and the forthcoming Oppenheimer-DuBridge-Lauritsen mission and warned that the three scientists might go beyond tactical warfare and

seek to enlist the Supreme Allied Commander in Europe in the war against SAC.

The antidote to Oppenheimer and company prepared by the Air Force worked. Norstad returned to Paris and got to Ike before the committee of scientists. When the General received them, he was heartened by their report on the feasibility of retarding Soviet ground forces with atomic weapons. But reluctantly he accepted Norstad's argument that retardation should never be carried out in lieu of a strategic air attack. The first target must be the enemy's own air striking force, the second his industrial plant, the third his ground forces.

Subsequently a watered-down version of the "Vista" report was presented successively to the Joint Chiefs of Staff, the Armed Forces Policy Council under Secretary of Defense Robert A. Lovett, and a seminar of some three hundred senior officers drawn from all the three services. Tactical use of atomic weapons and atomic "retardation" for defense of Western Europe ultimately were incorporated into the National War Plan, but not at the expense of SAC.

In an entirely different area, progress on M.I.T.'s gigantic study of U.S. air defense, "Project Lincoln," proceeded apace. The scientists, under able Dr. Killian, worked quietly and effectively on the orderly development of a complete air-defense system, with progressively better fighters and missiles to knock down enemy bombers, with infinitely better electronic methods of tracking and intercepting, and with a well-knit early warning system (radar net) that was gradually to push farther and farther from the U.S. heartland. The over-all goal of "Project Lincoln" was to build a defense system that could achieve a kill rate of 50 or 60 per cent of enemy bombers, a figure responsible scientists had determined was the best the U.S. could expect.

Actually, in line with the old military dictum that "the best defense is a good offense," the basis of U.S. air-defense strategy was to be found in the Strategic Air Command. The

Air Force believed the *best* way to stop an enemy bomber fleet was to destroy it on the ground in the Soviet Union. It considered efforts to down it while flying across Canada and into the United States as a last ditch and largely ineffective strategy. Such emphasis on offensive strategy brought the Air Force into conflict with many self-styled experts on air defense, not excluding the nuclear physicists. Indeed, the latter tackled the U.S. air-defense problem with much determination.

Many of the scientists found fault with a U.S. air-defense system that was based on the best-defense-is-a-good-offense theory. These scientists believed basically that the U.S. ought to rely on a defensive concept. They were quick to urge that the U.S. establish a sort of impregnable Maginot Line of the air.

"Project Lincoln" was large, and there was room for many—and any—ideas. Taking advantage of the open-door policy, Dr. Oppenheimer and several of his associates formed a Summer Study Group. The four men who formed the brain trust of the Summer Study Group and supervised its work came to be known as "ZORC" *—Z for Jerrold R. Zacharias, an M.I.T. physicist; O for Oppenheimer; R for Rabi; and C for Charles Lauritsen. Their immediate object: to prove the feasibility of a near-perfect air defense for the U.S. An "impregnable" air defense would, of course, undercut the "deterrent-retaliatory" strategy. A nation that could be a successful fortress would not need an offensive atomic weapon or a Strategic Air Command.

The fortress idea appears to have germinated from the thinking of Lloyd V. Berkner, who, as head of Associate Universities, Inc., had agreed to undertake the joint Air Force—

* This committee was first mentioned publicly by Charles J. V. Murphy, an editor of *Fortune*, in his penetrating article, "The Hidden Struggle for the H-Bomb," which appeared in the May, 1953, issue of *Fortune*, and for the first time publicly outlined the curious conduct of some of the scientists in the matter of the H-bomb.

NSRB scientific study of civil defense. Berkner's project, "East River," had been completed shortly before the organization of the ZORC committee. Like the "Vista" study, there was much in "East River" that was good and worth while. But again, like "Vista," there was the same vague, but discernible, hostility to SAC. "East River" concluded that passive defense measures would be of little avail against atomic attack unless the active defensive measures were able to reduce enemy bomber penetrations to mere "leakage"—a prospect for which Berkner held no hope so long as the Air Force placed its primary reliance on SAC. However, Berkner was himself convinced that because of "technical break-throughs" the advantage had shifted decisively to the defense. He was sure that a near leakproof defense was feasible—and the ZORC group seized upon his ideas.

In the summer of 1952, the group prepared to test its elaborate defensive concepts at the Lincoln Laboratory in Cambridge. Thirty-odd scientists from other universities participated in the planning and "war games." Its sessions lasted three months.

Generally speaking, the ZORC group confirmed, to its own satisfaction, what it had set out to prove: that an atomic air campaign could be successfully beaten down before the cities of this continent had suffered catastrophic damage. Its proposed defense system envisaged two major elements—an early warning system of interlocking radar stations far out on the Arctic rim (called the DEW line, for "deep early warning"); and behind this a "deep air defense" (or DAD) system utilizing guided missiles, supersonic aircraft, even squadrons of aircraft borne by "mother" aircraft on continuous patrol.

Some of the concepts of the Summer Study recommendations were sound. (Indeed, a form of DEWDAD was already under consideration by "Project Lincoln.") However, the method of approach was of questionable merit. These men, few of whom were noted as experts in the field of air defense,

placed their faith in a multibillion crash effort to build a chain of early-warning radar stations across the Arctic assuming in effect that such a chain should be our first consideration and that the U.S. could worry about defensive weapons and tracking and interception systems later. The recommendations of the Summer Study, in brief, suggested a jet-propelled, electronically hedged Maginot Line. Its eventual cost was never firmly fixed, but informal estimates ran from 50 billion to 150 billion dollars. Obviously an expenditure of this order would consume any U.S. defense budget likely to be voted by Congress. The U.S., Congress or no, would not buy this kind of DEWDAD and SAC as well.

An air defense is not likely at best to be decisive by itself. Assuming the U.S. began immediately to build a DEWDAD defense, it could only plan against weapons and speeds of the foreseeable future. It could only build within the present limitations of present knowledge. Years and billions of dollars later when it had this defense finally in place, the techniques of warfare and the knowledge of scientists would once again have advanced. Just as the French sat behind their Maginot Line, magnificently prepared for World War I when the blitzkrieg of World War II broke over them, the U.S. would sit behind its 750-mile-an-hour air defense when the 2,000-mile-an-hour war began.

The Air Force participated in the Summer Study. It grew alarmed as Air Force representatives watched the scientists repeatedly come to the conclusion in their war games that the DEWDAD system could bring down more enemy bombers at less cost. The name ZORC was not mentioned. In fact it was not known to the Air Force until late August of 1952 when an Air Force officer, dressed in civilian clothes, unofficially attended a rump meeting of the Summer Study Group. There, on a blackboard, he spied the initials "Z.O.R.C." and the full names of the men written out in smaller print following each initial. Like a well-trained military officer he

jotted them down and later filed a report on ZORC and its conclusions to Air Force headquarters.*

Not only was the Air Force finally disturbed about the proposals of the Summer Study Group, but so also was M.I.T. The Air Force concluded an understanding with M.I.T. that the Summer Study Group findings would not be published. Nevertheless, it was not long before the recommendations of the group had been leaked to the press. Many columnists, before thinking through the implication of the ZORC committee, began to argue its cause. By early fall, the substance of the recommendations had (through unofficial channels) turned up at the White House, at the State Department, and at the Secretary of Defense's office. The new NSRB Chairman, Jack Gorrie, moved in the National Security Council for a new national military policy to be built around the fortress concept. The idea was rejected.

Somewhat startled by the performance of the Summer Study Group, Killian's air-defense experts at M.I.T. nevertheless kept to themselves, quietly developing an extraordinarily effective and well-balanced air-defense system, which would provide maximum effective protection without depleting funds from the U.S. Strategic Air Command. The system developed by "Project Lincoln" is now going into effect.

* Air Force Chief Scientist David Griggs also observed "Z.O.R.C." on the blackboard, and later described Dr. Zacharias as the man who had written it. During the Oppenheimer hearings, Zacharias testified that he had never heard of ZORC until he had seen the reference in the *Fortune* article. The hearing record was closed before the Air Force officer's memorandum, written at the time, could be entered, but Dr. Gray at least among the members of the hearing panel was satisfied that ZORC was as *Fortune* had reported.

Chapter 19

SAC

FOR A BRIEF PERIOD IN 1953, after the Eisenhower Administration first took office, the offensive concept and the air power to back it up fell from favor. Budget economizers Charles E. Wilson and Roger Kyes, Secretary and Deputy Secretary of Defense, respectively, slashed the Air Force from 143 to 120 wings.

The Eisenhower Administration later reversed its position with respect to air power. In January, 1954, Secretary of State John Foster Dulles announced the Administration's policy of reliance on strategic air power for basic security and on collective action of the allies to meet local situations. The military establishment adopted the "New Look" and recast itself around the offensive capability of the Strategic Air Command and a 137-wing Air Force.

The Eisenhower Administration policy actually kept its roots in the system of collective security, the community of free nations bound together in self-defense through such alliances as NATO and similar alliances in Asia.

Secretary Dulles said:

The essential thing is that a potential aggressor should know in advance that he can and will be made to suffer for his aggression more than he can possibly gain by it. This calls for a system in which local defensive strength is reinforced by more mobile

deterrent power. The method of doing so will vary according to the character of the various areas.

Most areas within the reach of an aggressor offer less value to him than the loss he would suffer from well-conceived retaliatory measures. Even in such areas, however, local defense will always be important. In every endangered area there should be a sufficient military establishment to maintain order against subversion and to resist other forms of indirect aggression and minor satellite aggression. This serves the indispensable need to demonstrate a purpose to resist, and to compel any aggressor to expose his real intent by such serious fighting as will brand him before all the world and promptly bring collective measures into operation. . . . Potential aggressors have little respect for peoples who have no will to fight for their own protection or to make the sacrifices needed to make that fighting significant. Also, they know that such peoples do not attract allies to fight for their cause. For all of these reasons, local defense is important. *But in such areas the main reliance must be on the power of the free community to retaliate with great force by mobile means at places of its own choice.* [Authors' italics].

The plain facts of the hydrogen age were that the basic security of the U.S. and its allies depended on the ability of the U.S. Strategic Air Command to carry out its mission. More than ever before, it was important that SAC be maintained in a state of instant readiness.

By mid-1954, after five years as SAC's uncompromising commander, General LeMay had brought SAC up to a level of military preparedness that, while it did not completely satisfy him, gave him a measure of confidence. SAC's physical plant had grown enormously. It consisted of 32 modern bases (40 planned); 20 foreign bases; an estimated 3,000 strategic aircraft, including about 175 B-36 intercontinental bombers, more than 400 medium-range B-47's, as well as a variety of support aircraft ranging from F-84G fighters to giant C-124 Globemasters. SAC's planes and bases were manned by 175,000 top-grade, highly trained personnel. Of the 137 wings in the

newly planned Air Force, SAC would comprise 54, or more than one-third.

In mid-1954, the most modern bomber operated by LeMay was the medium B-47, the four-jet, drooped-wing Boeing Stratojet, which LeMay had ordered to replace the aging piston-powered B-29's and B-50's. After several years of trials and errors, and a final delay due to extensive bugs, the B-47 began to be placed in units in 1953. At first distrusted by SAC pilots (early models had no ejection seats), the B-47 soon became famous in SAC as the greatest combat plane ever built in the United States.

Piloted by three men, the B-47, combat-loaded and in flight, was almost all fuel and bomb load. It could travel at speeds up to 600 miles an hour, at altitudes up to 45,000 feet, for distances of up to 3,000 miles without in-flight refueling. The B-47 was designed primarily as a medium-range bomber, for use from overseas SAC airfields such as those in Britain, North Africa, Japan, and Greenland. In-flight-refueling techniques soon stretched the range of the B-47 to well over 6,000 miles. Through use of this system, the B-47 could be flown for twenty-four hours with half a bomb load. In 1953 SAC refueled an airplane every six minutes around the clock.

The B-47 gave SAC tremendous world-wide mobility. With this aircraft LeMay developed the capability of moving entire wings of bombers from base to base around the world. On a B-47 wing movement to England, from Limestone, Maine, the slowest time for any one of the forty-five planes in the wing making the 2,750-mile trip was five hours, thirty-six minutes. In February, 1954, a B-47 wing flew 5,000 miles from Louisiana to North Africa in ten hours with one refueling, rested from eighteen to twenty-four hours, then went on to a simulated bombing mission over Europe.

At the core of SAC striking power stood seven heavy bombardment wings, built around the mammoth intercontinental B-36 bomber. These 175-odd aircraft, equipped with four auxiliary jet engines mounted under the wings in two

Pods, to increase speed over the target area, were all based at SAC fields within the boundaries of the United States. Fast growing obsolete, the B-36's were scheduled to be replaced by the Boeing B-52, an eight-jet version of the B-47, with intercontinental range and speeds up to 600 miles per hour. Like the B-47, the B-52 carried a bomb load of about 20,000 pounds, enough to handle conventional atomic weapons or thermonuclear weapons, and a crew of three men.

As important as equipment were LeMay's pilots and plane crews. By mid-1954, he had trained them to the point where they were indisputably among the finest in the world. Gentle, hard-working, serious-minded "engineers of the air," SAC's pilots were the very antithesis of the once-glamorous Air Force pilot who wore a flabby fifty-mission cap, and an oversized cluster of fruit salad on his chest. Thirty-two years in age, with nine years' service in the Air Force, the average B-36 pilot had flown 4,000 hours; an average B-47 pilot 3,500 hours; both were married and had children. What they did as everyday, routine work would alarm the ordinary ground mortal—refueling a B-47 in flight, for example, at around 300 miles per hour, close to stall speed and attached to a boom on a flying tanker three feet away.

There was no room in SAC for hot-shot pilots. The business of flying intercontinental aircraft was demanding, tedious work requiring the "slipstick," not slapstick. Indeed, the very act, for example, of getting the B-47 in the air under ordinary circumstances was a feat that required several hours of desk briefing, an hour's briefing and inspection outside the plane and inside the plane, half an hour of checking the controls from one man to another over the intercom. The aircraft commander took along a bulging briefcase, stuffed as an executive's on a weekend, and constantly plunged into it to make computations on weather, altitude, speed, weight, fuel, and flight plans.

The moment of take-off of a B-47 was calculated to the very second. Control on LeMay's SAC bases was at least as

rigorous as that employed by the commercial airlines. When the 301st Wing flew to French Morocco in February, 1954, twenty-six B-47's took off from Sidi Slimane Air Base on the second and final leg of the mission like a parade group, exactly fifty-five seconds apart, and all passed their runway markers and "point of no refusal" (the marker where the pilot has his last chance to refuse to take off) at identical speeds and left the ground at the identical spot. "With all this complicated machinery and regulations," one air commander remarked, "it's not so romantic as in the old days, but I love it."

The best SAC crews were designated "lead" crews. These crews were assigned specific targets in Russia or elsewhere and had to commit to memory all of the intricate details of getting on target and back to a friendly base. Members of lead or select crews usually got spot promotions to the next highest grade. But their skills were constantly being evaluated—in the squadron, in the wing, and every six months by a two-week special check by LeMay's personal examiners. If a select or lead crew fell behind in bombing, navigation, or whatever, it lost its promotions.

Twenty-four hours a day SAC pilots fought an imaginary war that could instantly be changed into a real one. Day after night after day, SAC crews arched across the globe keeping up with heavy SAC training requirements in all-weather flying, navigation, gunnery, radar detection and deception, and high-level (above 40,000 feet) bombing on target. Once every three months each crew was ordered to fly a grueling practice mission that was equivalent in length to the distance from the U.S. to Russia and return and put its crews to a realistic test of proficiency.

While he thus cocked the arm of the West's Sunday punch, LeMay also kept one eye cocked on his own back yard. Better than anyone, LeMay realized that if war came, SAC would be the first and prime target of the Soviet bombers. The ability of the Soviets to prosecute a war without themselves being annihilated rested squarely on their capacity first to

knock out the U.S. Strategic Air Command. LeMay needed no blueprint to realize that in a war of strategic air commands, his own command would suffer certain handicaps.

First there was the matter of target intelligence. The Soviets would need no special agents to collect information relating to the disposition of SAC airfields and SAC aircraft. As one of the penalties of a democratic system, most of SAC's operations were in clear view of anyone interested enough to take a look. Secondly, there was the matter of initiative. In any war, the Soviets would strike first, a fact that gave them an obviously enormous advantage. LeMay would have to shape his entire tactics around the matter of surviving an initial blow from the Soviets.

Another great advantage of the Soviets lay in their ability to hit LeMay from within—through sabotage. LeMay began to take simple precautions against this possibility early. He ordered his officers to wear sidearms at their desks, at meals, and in the air. His "A.P.'s" (Air Police) cradled loaded carbines ready for sabotage or parachute attack. Even ground crewmen worked at their big planes with their guns beside them. At one base, LeMay strode by a master sergeant who had laid aside his piece to dive into his lunch bag.

LeMay promptly rounded up all the maintenance men on the base. In a lecture that later became famous throughout SAC, LeMay snarled: "This afternoon, I found a man guarding a hangar with a ham sandwich. There will be no more of that."

Of far greater concern to LeMay was the task of protecting his aircraft and flight crews during the initial Soviet blow. If his planes and crews were destroyed on the ground, LeMay knew he would never have the ability to launch instant and massive retaliation. LeMay first asked Washington to increase its intelligence efforts to a point where the U.S. could have as much warning as possible when the Soviets began launching an air attack. Then he drew up certain plans that concerned the matter of getting SAC planes into the air—even if only

temporarily—during a Soviet air attack. If he could save his planes and pilots, it would not matter as much if his airfields were destroyed. Later SAC planes could land anywhere—at LaGuardia Field or on highway strips if necessary—long enough to take aboard atomic and thermonuclear weapons and gasoline.

Following through with this plan, LeMay ordered special, secret command and communications centers constructed, so that if his headquarters at Offutt Field were bombed out, the alternate locations could take over the direction of SAC activities. As for himself, LeMay outfitted one of his transport planes with special communications equipment so that if necessary he could follow his own planes aloft during a Soviet attack and direct the regrouping and dispatching of his aircraft after the Soviet raid. LeMay developed special “flyaway kits” for each SAC wing, emergency packs that could be slipped into a bomber’s bomb bay, and carted to either the emergency base or overseas base to serve as initial supplies for staging attacks against the Soviets.

LeMay said, “I expect that if I am called upon to fight I will order my crews out in those airplanes, and I expect to be in the first one myself.” One of LeMay’s staff officers said, “I’m damned glad he’s not on Russia’s side.”

Chapter 20

SUSAC

WHILE PUSHING ahead with a vast nuclear weapons program under the direction of the late Lavrenti Beria, which produced first "Joe One" and later, in August, 1953, a one-megaton thermonuclear bomb, the Kremlin began a concurrent and unprecedented build-up of its air forces, with particular emphasis on long-range strategic bombing. By mid-1954, after a decade of effort, the Kremlin could count at least 20,000 aircraft under its command, more than 70 per cent of which were modern, jet-powered types. Another 20,000 aircraft of older vintage were in reserve. Production rates stood at 10,000 a year, a figure that matched that of the great U.S. production machine. Modern, efficient, manned by rugged, dedicated pilots and personnel, the Red Air Force in 1954 represented, quantitatively, the world's largest single pool of national air power, exceeding even that of the United States by a very wide margin.

The rise of the Soviet air power, both quantitatively and qualitatively, was a spectacular achievement. Not much was known about the Red Air Force before the Spanish Civil War. Most people thought that backward Russia lacked the technical skill to produce first-rate planes of its own. During the twenties, held back by the Versailles Treaty, Germany's Heinkel, Dornier, and Junkers plane builders set up plants in

Russia and built planes for the Red Air Force. The Russians got their engines from the U.S.

By the time of the Spanish Civil War, Hitler was putting German designers to his own use, but the Russian "volunteers" showed up with fairly good planes of their own. Chatos and Ratas with 750-1,000 horse-power engines rose up to battle the *Luftwaffe* "volunteers." They were 100 miles per hour slower than the Messerschmitts, but they had better range and could turn circles inside their heavier opponents. At Guadalajara, 125 Russian-piloted fighters routed an attacking Italian armored division, the first decisive use of tactical air force in aviation history. Soviet designers and airmen were learning.

World War II gave Russia's "Golden Falcons" a chance really to spread their wings. For two years the air forces of heavy-set Marshal Alexander Novikov took a dreadful beating. The first eight weeks saw 5,000 of Russia's initial 8,000 planes put out of action. But Novikov kept sending more fighters up to challenge the Nazi *Luftwaffe*. The U.S., doing its best to help a besieged ally, sent fighters: the Bell P-39 Aircobras and Curtiss-Wright P-40's. Russia's own factories were moved east of the Urals and worked overtime to keep up. "In twenty-four hours," said one plant manager, "these planes will be at the front killing Germans."

Russian pilots flew like Cossacks. They liked to toss off bottles of vodka, then, without warming up their engines, hurtle down runways and take off simply by hauling up their wheels. In combat, Red flight leaders flew above and behind their men to make sure no one shied away. They were never the finely honed fliers Germany had for her *Luftwaffe* (the average life of a *Stormovik* pilot was seven missions), but there were always plenty to take the place of those who died.*

More important, a handful of talented Russian aircraft designers—led by Mikoyan, Lavochkin, and Yakovlev—rose to the occasion, producing fighters that were rugged and

* The Soviets trained some women pilots.

maneuverable, though still second-rate planes by German and U.S. standards. The best ones were derived from Western models. But in tactical air, the defense-conscious Russians took a back seat to no one. One of the best ground-attack planes of World War II, the armor-plated *Stormovik*, came off the drawing board of another Russian, Sergei Ilyushin. German Panzer divisions called it "the black death." In one ten-day period, the *Stormovik*'s knocked out over 400 Nazi tanks. The Russians also learned to build planes in a hurry. By 1945, Russia's factories were turning them out at the rate of 40,000 a year, and her first-line air strength rose to 20,000 aircraft.

At first, the Soviets did not seem to recognize the potential of strategic bombing. During the war, U.S. Air General Hoyt Vandenberg went to Moscow to explain strategic bombing to the Russians and convince them that it was worth while. The Russians put on a great show of being disinterested in Vandenberg's photos of gutted Nazi factories. "All altitudes above fifteen feet over the tree tops are wasted," they said. But in the Battle for Berlin, when the *Luftwaffe* had already been crippled by the RAF and the U.S. Air Force, the Russians proved that they had been listening. For sixty days, Russian artillery and a hundred Soviet air armies (about 12,000 planes) rained down shells and bombs on Berlin. At war's end, the Red Army marched in over a city of rubble.

In 1946, Stalin gave the signal for an entirely new emphasis in Soviet military strategy. While the allies disarmed, relying on the monopoly of the atomic bomb, the Soviets, while maintaining their 175-division army, began a build-up of a vast new air force. High among the prizes snatched from Germany by the victorious Russians were the newfangled Nazi jets. Red pilots reported speeds up to 500 miles per hour, no vibration, no disconcerting torque.

For Russia with its backward industry and limited oil reserves, the jets were an answer to a Communist's prayer. Jets are rugged, have fewer moving parts, only a few of which have to be machined to fine piston-engine tolerances. They do

not necessarily need high-octane gas, but fly on kerosene, wood alcohol, or, as one U.S. officer put it, "even on coffee or old rags." The NKVD was instructed to round up everyone in Germany who knew how to build jets. A few German plane builders escaped, but 80 per cent of the Nazi aircraft industry—then well ahead of the U.S. on jet development—was whisked behind the Iron Curtain. The Russians got designer Sigfried Gunther of Heinkel; they moved the Junkers works to Kuibyshev. Dozens of new Messerschmitt-262 jet fighters were shipped off to Russia.

By 1947, the results of the Soviet research into jet fighters, with the help of Nazi engineers, were evident. In that year the first top-notch Russian jet fighter, the MIG-15 appeared. It had a high roosterlike tail, a barrellike fuselage. It had swept-back wings, quick visual proof that the Russians had been attentive to transsonic research. It was light and maneuverable and powered by the best existing jet engine, the Rolls-Royce Nene, which the British Labor government sold to Russia.

By 1950, production of the MIG rose to 5,000 per year. The Soviet aim, according to intelligence reports, was a level of 15,000 MIG's—a good record even in U.S. terms. In Korea, the U.S. learned just how good the MIG was. In fights with the U.S. F-86 Sabrejet, the MIG proved that it could climb more nimbly and cruise at higher altitudes. The Russians had sacrificed safety factors to produce a lighter, more maneuverable fighter. The F-86 pilots shot them down at a rate of 14 to 1, because F-86 pilots were better trained and had better gunsights and a superior knowledge of jet-fighter tactics, which they used to advantage against the MIG.

But by far the most important development in Soviet air power occurred in the area of strategic bombing. After the war, Russia's master of tactical air power, Air Force Chief Alexander Novikov, was fired and jailed. Just about that time, Russia turned more of her attention to heavy bombers, and even separated its Air Force from the ground command.*

* It has since been returned to Army control.

The new air boss was a Communist Party favorite, forty-six-year-old Marshal Konstantin Vershinin, Hero of the Soviet Union, and a World War II commander of the Far East Air Forces. While the U.S. debated with Dr. Oppenheimer and friends the merits of the hydrogen bomb and the offensive concept, Vershinin ordered the Red Air Force to get busy with the development of *Aviatsiya Dalneve Devstviva*, or the Soviet Strategic Air Command.* The Soviets had put their money on the offensive theory.

SUSAC had not had a very bright history in Russia up to that point. What existed of it early in World War II was practically wiped out by the Nazis. Its wartime leader, Lieutenant General Kopets, committed suicide in disgrace. He was replaced by Air Marshal A. E. Golovanov, an experienced airman about whom little is known outside of the Iron Curtain. Whether or not Golovanov still commanded SUSAC in 1954 was problematical. His name had not been mentioned in the Soviet "press" for several years.

Be that as it may, the postwar reorganization of SUSAC, ordered by Vershinin, was carried out by Golovanov. He began by looking around for an appropriate bomber with which to equip his force. The best thing that met his eye was the U.S. B-29 bomber, several of which had been forced down in Soviet territory during World War II and confiscated. Vershinin ordered Soviet aircraft designers to make a Russian copy of the B-29. Within one year, Tupolev had not only copied the B-29 (improving it slightly in the process) but had also produced appropriate blueprints for mass production. Soon B-29 copies, which the Russians called TU-4's, were coming off Soviet production lines in quantity.

In the beginning, SUSAC was a sad SUSAC. The Soviets lacked experience in organizing and training large bomber forces. At first, Soviet air commanders sent poorly trained crews aloft in the TU-4's without plan or reason. Like many U.S. Strategic Air Command pilots at the time, the Soviet

* Called SUSAC by U.S. airmen.

pilots flew only in good weather and simply "bored holes in the air." Hindered by maintenance problems and inadequate airfields to handle the large bombers, SUSAC was not a very satisfactory fighting force.

But after the Korean War and spectacular success in the nuclear-weapons field, the Soviets began to reshape SUSAC into a more efficient unit. Under the "conversion" program, SUSAC was modeled closely on the U.S. Strategic Air Command. Efforts were made to increase proficiency in navigation and bombing, both visually and by instruments. The captured Norden bombsight was replaced by a crude electronic model. Cross-country flights of progressively greater range were ordered. Large-formation flights were instituted, as well as over-water flights. The techniques of in-flight refueling were explored. Day in and day out, SUSAC pilots made simulated bombing runs on U.S. cities across the wastes of Siberia. A widespread SUSAC base-construction program was initiated, including bases in northern Siberia—as close to the U.S. as possible. The production of TU-4's soared. By 1951, SUSAC was equipped with 700 operational bombers, and by 1954, with more than 1,200.

Meantime, Soviet air designers, including Tupolev, were hard at work, designing modern Soviet bombers. The first of these to appear was a huge model similar to the U.S. B-36. It was originally sighted at the Moscow Air Show in 1951. Western intelligence observers who obtained pictures of the huge bomber dubbed it the "Type 31," and deduced that because of its configuration, it was probably powered by turbo-prop engines. If this was so, it seemed certain that the "Type 31" could exceed the range and speed of the B-36, a serious cause for concern. But little or nothing further was ever heard of the "Type 31." Western intelligence experts soon began to believe that the Soviets had dropped the design altogether.

Credence was lent to that line of speculation when at the Moscow Air Show in 1954, two wholly new, unexpected Soviet jet bombers appeared. One was a medium-sized bomber

similar in appearance and size (and presumably performance) to the U.S. four-jet B-47. From photographs that U.S. intelligence agents obtained, aircraft experts judged that the plane, which they dubbed the T-39, was designed by Ilyushin, had a 35-degree swept wing, and was powered by two enormously powerful jet engines (of perhaps 15,000 pounds' thrust), which were buried in the wing roots near the fuselage. U.S. experts figured that the plane could probably travel at 550 to 600 miles per hour up to altitudes of 40,000 feet, and possessed a combat radius of about 2,500 miles. Seven of these aircraft were sighted on one airfield in Moscow, a fact that led U.S. observers to conclude that the medium bomber was already in mass production.

Of equal interest, or perhaps more interest, was the other Soviet jet bomber sighted at the 1954 Moscow Air Show, a huge B-52-like aircraft, which was dubbed the T-37. Since the Soviets carefully flew the plane all over Moscow at 200 feet, U.S. intelligence agents obtained many fine photos. From these, experts concluded that the plane—155 feet long and with a swept wing (40 degrees) of 170 feet span—was of Tupolev design. Its fuselage measured 11.5 feet in diameter, the bomb bay 17 feet long and 6 feet wide, sufficient to carry either 10,000 pounds of all-purpose bombs or a conventional atomic bomb. The giant plane, according to the photographs, was powered by four huge jet engines (estimated at 15,000 pounds' thrust) buried in the wing roots, like the engines of the British Comet jet airliner.

It was possible, and indeed some of the West's intelligence experts suggested, that the 1954 Soviet show of jet bombers was a clever bluff designed to mislead the West into believing the Soviets had put their money on jets, while behind the Urals they secretly built more and more turboprop "Type 31" bombers. However, this line of speculation was all but dropped when, during the first week in June, 1954, only a month after the May Day Air Show, the Soviets flew sixty B-47 types over Moscow in perfect formation. This massive

flight indicated that the medium jet bomber certainly was in full-scale production and probably meant that the large T-37 was also in mass production.

In the important field of guided missiles, by 1954 the Soviets had also made significant strides. For years, the Soviets had been interested in the rocket as a military weapon, and even during the thirties experiments were carried out along that line. At the close of World War II, the Soviets made a special effort to capture the German rocket-research installation at Peenemünde, where the V-2 was developed, and the underground Mittelwerke factory at Nordhausen in the East Zone, where the V-2 was mass produced. The Soviets made off with more than 175 of the top German missile designers and scientists.

While the U.S. dawdled with the firing of its few V-2's after World War II, the Soviets set to work under the direction of Georgi Malenkov and actually produced more than a thousand missiles of this type, both for experimental purposes and to gain valuable production experience. They succeeded in improving the V-2 in several important ways. In the meantime, captured rocket experts were working on advanced designs.

One U.S. rocket expert, G. P. Sutton of North American Aviation Company, in early 1954, reported the existence of a new Russian rocket engine, which he called the M-103. According to Sutton's claims, the engine weighed no more than two passenger cars, yet it was capable of developing thrust upward of 264,000 pounds per second, at sea level. Such thrust is equivalent to the power of more than fifty conventional jet engines and exceeds by a factor of five the power of the V-2 ballistics rocket.

Sutton warned that an engine of this weight and developing such gigantic thrust had certain far-reaching implications the U.S. could not afford to ignore. It meant, for instance, that the Soviets had made great progress with the problem of heat resistance (for such an engine would otherwise burn itself

up). This, in turn, meant that the Soviets had probably made strides in the problem of re-entering the atmosphere, when very long-range missiles tend to burn up, like meteors, from atmospheric friction. The existence of the M-103, in short, meant that the Soviet already possessed an essential component for a long-range, intercontinental missile.

Such Soviet development is hard to confirm through intelligence sources and at best is only speculation. However, by mid-1954, the nation's best air intelligence experts stated as their opinion that by 1960, the Soviets would have in operation a two-stage missile that would carry a 3,000-pound warhead 2,700 miles with an accuracy of from 4 to 5 miles, ample for the delivery of thermonuclear weapons with a destructive radius of ten or fifteen miles or more. The same intelligence experts estimated that by 1963-65, the Soviets would have a two-stage intercontinental missile capable of exceeding 4,000 miles in range and hitting within 5 miles of the point of aim.

In spite of such sweeping technical advances on the part of the Soviets, at mid-1954, the qualitative status of SUSAC remained a large question mark. While the Soviets flew modern bombers over Red Square, the fact remained that the mainstay of the Long-Range Air Force was the TU-4, which, with its 350-mile-per-hour cruising speed, could not possibly hope to outmaneuver modern U.S. jet interceptors. Moreover, with its range limited to 4,000 miles, the TU-4 was incapable of round trips between the major U.S. cities and the nearest Soviet bases.

There was some question about the crew readiness in SUSAC. There is no substitute in war for experience. SUSAC, in 1954, like the Soviet submarine fleet, was untested in war. Moreover, Golovanov had undertaken to compress into less than a decade all the hard-bought experience that the U.S. and British airmen had accumulated through decades of trial and error. His raw material consisted of a cadre of airmen who were bad instrument pilots, who had little experience in long-range operations, especially at night, and who had only

a perfunctory knowledge of the theories of strategic bombing.

The Soviets were rapidly overcoming these deficiencies in personnel, just as they were trying to modernize their air fleets. Yet it seemed doubtful that in so short a period SUSAC could have been driven to a point where it could anywhere near match the efficiency of the U.S. Strategic Air Command. It had had no experience to compare with General LeMay's in moving forces with great rapidity in and out of bases across the world. SUSAC had no strategic air bases beyond the Soviet rim—a great handicap; it had no really effective all-weather radar bombsight.

Nevertheless, the fact remained that the Soviets had the capability of launching at will, a massive air armada of more than a thousand TU-4 bombers, equipped with either atomic or thermonuclear weapons, against the United States on one-way missions. If a madman desired to expend the Soviet supply of pilots and aircraft in one crippling—perhaps decisive—blow against the U.S., the Kremlin actually had the capability of doing so. By employing even a crude system of aerial refueling, the Soviets could extend the range of its bomber fleet sufficiently to permit a raid on major U.S. cities, returning the TU-4 bombers to air bases in northern Siberia.

From 1954 forward, SUSAC's capability could be expected to improve enormously with the passing of each year. Thus LeMay's superior training, equipment, and know-how seemed only a temporary advantage. By 1957, U.S. intelligence officers estimate, the T-39 medium-range jet bomber would be in SUSAC operational units. By the following year, the huge intercontinental T-37 would be available in sufficient quantities to make a 600-mile-per-hour, 50,000-foot, all-weather, thermonuclear bombing attack on the U.S. A few years later Soviet missiles would be ready for very long-range operations.



PART FOUR



Chapter 21

LESS THAN CANDID

BY MID-1952 the vigorous pattern of activity on the part of J. R. Oppenheimer over the years, regarding both the hydrogen bomb and the strategic air concept, had aroused the genuine concern of a small handful of officials in Washington. In April, 1952, Secretary of State Acheson appointed Oppenheimer to be a member of the State Department's Disarmament Committee. Members of the Committee, under the chairmanship of Oppenheimer, soon proposed that the forthcoming test of a full-scale thermonuclear explosion at Eniwetok, scheduled for the fall, be canceled. Some Committee members further proposed that the President should announce that the U.S. had decided on humanitarian grounds that it would regard detonation of a similar device by another power as an act of war.

Though the suggestions did not come directly from Oppenheimer, they came from members of his committee. Had they been accepted, they would have in effect tripped up the U.S. in the race for survival. There were honest men in Washington who, mistakenly or not, believed Oppenheimer was responsible for the suggestions, and these men believed they could discern a disconcerting pattern in Oppenheimer's thinking.

Major General Roscoe C. Wilson, an Air Force atom specialist, had gone to the Chief of Air Force Intelligence to express his concern. Dr. David Griggs, Air Force Chief

Scientist, was told by Secretary of the Air Force Thomas Finletter and Air Force Chief of Staff Hoyt Vandenberg that they had serious questions as to the loyalty of Dr. Oppenheimer. "It was clear to me," Griggs said later, "that this was not an irresponsible charge on the part of Mr. Finletter or on the part of General Vandenberg." Griggs was also to say later that "Dr. Oppenheimer is the only one of my scientific friends about whom I have ever felt there was a serious question of their loyalty."

Among those who felt growing concern was the Executive Director of the Joint Congressional Committee, William Borden. Borden was one of the few men in government (besides Oppenheimer) with access to the entire atomic program, from the AEC to the Central Intelligence Agency, from the Pentagon to the State Department, and from the U.N. and NATO to the National Security Council. Since taking charge of the Committee staff in 1949, Borden had watched and investigated with more than casual interest the activity of the man who seemed to Borden his most vigorous opponent in the struggle to provide the U.S. with a large stockpile of modern atomic weapons. Borden began a systematic search of past records and decisions.

Borden later privately told friends: "The entire time I spent working for the Committee was spent fighting the paralysis which gripped the Atomic Energy Commission and the Pentagon. The more I looked, the more it appeared to me that J. R. Oppenheimer was responsible for this paralysis—not merely as to the H-bomb but as to each new type of A-bomb which was proposed, each plant expansion, raw materials step-up, detection of Soviet test explosions, each reactor project, each step designed to strengthen the military and peacetime industrial power position of the U.S. We won all our battles, but in each case J. R. Oppenheimer's influence delayed us from one to four years."

A strong case had been made publicly in behalf of the atomic scientists and members of the first Atomic Energy Commission

that, if they opposed weapons, they certainly worked diligently to advance the peacetime uses of atomic energy. Borden concluded that this also was contrary to the record. First there was the extraordinary case of the program at Oak Ridge to build an atomic power plant. As a result of various investigations, he came to the conclusion that the following *New York Herald Tribune* story dated May 24, 1948, was substantially correct:

Ever since the war ended, Oak Ridge has considered itself the leader in research that would lead to the peacetime uses of atomic energy, the so-called power pile. The program had been set up by Dr. Eugene P. Wigner of Princeton, one of the most respected physicists in the United States. It was proceeding, Oak Ridge believed, with all celerity. Then, without warning, the AEC decreed that the program be terminated. Power work, it was announced, would henceforth be centralized in the Argonne Laboratory, outside Chicago. Dr. Wigner's program was jettisoned. The scientists who were employed on it might be rehired by Argonne and might not; the AEC would not bind Argonne's hands.

This struck at the roots of Oak Ridge. Men and women who had planned to make their careers there were told they would soon be jobless. Scientists in other divisions were distraught; their sections might be the next to go. The decision had been made without consulting Oak Ridge and the scientists remembered again that they alone, of all the major installations, are without representation on the General Advisory Committee to the AEC. Worst of all, there was no explanation of the move, beyond a half-hearted statement that it was considered desirable to centralize power research.

Said Edward Teller of the move: "It set our reactor work back many years. . . . I would like to count this as one of the very great mistakes that have been made. . . ."

In fact, no atomic peacetime power reactor ever materialized as a result of the efforts of the AEC. It was literally shoved down AEC's throat by a controversial Navy Captain named

H. G. Rickover. A hard and persistent fighter, Rickover pounded on the AEC all during 1946, 1947, and 1948 in a vain attempt to get the Commission to launch a serious effort in the field of mobile atomic reactors. He met with resistance everywhere except in the Joint Congressional Committee. The General Advisory Committee, under Dr. Oppenheimer, ruled that Rickover's project was technically premature.

An extraordinary man, Rickover refused to be put off, and finally, in early 1949, broke through the resistance and got approval to begin the first atomic reactor that would, in effect, turn a wheel. In four years—an incredibly short period of time for a fully matured project—Rickover's atomic submarine engine began to turn over in a mock submarine hull in the desert at Arco, Idaho. The AEC, under Strauss, promptly made Captain Rickover boss of AEC's belated peacetime power program.

Borden considered that at least a partial explanation of the delay could be found in a news story from the Oakland, California, *Tribune* under the date of June 23, 1949, roughly the time that Rickover had wrested his go-ahead from a reluctant AEC:

Berkeley, June 23. Dr. J. R. Oppenheimer, 44, the noted atom-bomb scientist, is back on the University of California campus he left two years ago for the world scene. . . .

He termed the prospects of civil atomic power extremely remote and from any viewpoint extremely unimportant.

"Nuclear power for planes and battleships is so much hogwash. I think the difficulties have been underestimated."

Civil power will take a long time, enormous investments of money and the all-out cooperation of industry, he said, adding "if we can't get there in 25 years, we might as well take it easy."

Dr. Harold C. Urey, Nobel-prize-winning physicist, has commented on the lack of enthusiasm on the part of the General Advisory Committee and AEC in the atomic power

field. On the University of Chicago Round Table radio program on November 25, 1951, he said:

I myself feel that there has been a lack of enthusiasm for the development of useful atomic power. I spent some time at Oak Ridge last summer myself, working on this problem. It is a difficult problem; but it does not look impossible to me that useful atomic power can be secured. And I returned to Chicago to find prominent members of the Scientific Advisory Committee advising the public that all this sort of effort is not of much value. Dr. James B. Conant made a speech in New York saying that by 1960 we would all drop the development of atomic power as something which was not worth a candle; and Dr. Lee DuBridge of the California Institute of Technology says that it will be thirty years before atomic power can be developed. Other members of this Scientific Advisory Committee say that the development of atomic power is not worth while. All these things remind me of the fact that this Committee was not the one to push the development of the H-bomb. I believe that there has been a lack of enthusiasm by people who are advising the government on this subject which is wholly unjustified, and it might be well if such a position were revised in the future.

Similarly, plant expansions of the Atomic Energy Commission, to keep pace with the growing military requirements for atomic weapons and power reactor fuel, met with roadblocks and delays. Had it not been for the Korean War and the late Senator McMahon, it is likely that the early 1950 AEC expansions (the beginning of Savannah River and extension of Oak Ridge), the early 1951 expansions (extension of Savannah River and Hanford and start of Paducah), and the 1953 expansion (Portsmouth, plus additions at the other locations) would never have occurred.

The 1953 expansion was the largest and most significant. Over the objections from the AEC, Brien McMahon, just before his death, personally pushed it through. Senator Bourke Hickenlooper waged a singlehanded fight on the floor of the

Senate when the money appropriation came before Congress; and this last-ditch effort saved the program.

On the strength of his convictions, Borden decided to do everything within his power to prevent Oppenheimer's reappointment to the General Advisory Committee. Oppenheimer's five-year term as Chairman of the GAC, his main government job, was due to expire in June, 1952. Borden soon discovered that there were men in the Pentagon, especially Robert LeBaron and Thomas Finletter, who for one reason or another saw eye to eye with his objective. Moreover, by the spring of 1952, some top U.S. scientists had secretly opposed Oppenheimer's reappointment to members of Congress and the President.

Word of this opposition began to circulate. Oppenheimer himself wrote the President, stating that he did not seek reappointment to the Committee. Then, a campaign to force his reappointment broke out among Oppenheimer's friends. The leader of this campaign was the Chairman of the AEC himself, Gordon Dean. Dean was backed in the Commission by Commissioners Smyth and Glennan. Only Tom Murray among the Commissioners opposed the reappointment of Oppenheimer.

As it progressed through the spring of 1952, the struggle between the pro- and anti-Oppenheimer factions grew bitter. It contributed a widening chasm between the ailing Brien McMahon and his former law partner, Gordon Dean.

At length, Gordon Dean, once again under pressure from many quarters, capitulated and declined to recommend reappointing Oppenheimer as Chairman of the GAC. At the same time Lee DuBridge and James B. Conant were also dropped from the Committee. Oppenheimer was appointed by Dean as a "consultant" to the AEC for a period of one year, the term expiring in June, 1953. The scientific community, when it learned of the shake-up, was startled.

Soon after Dwight Eisenhower took office in January, 1953, the Joint Congressional Committee, on Borden's urgent recommendation, took steps to take to the White House a report on

the origins of the hydrogen-bomb program. Six months later, just as he resigned his committee post to enter industry, Borden prepared four hundred questions that troubled him about Dr. Oppenheimer's role in the atomic-energy program.

The Congressional Committee documents and questions that Borden had prepared came into possession of Lewis Strauss, who, under the Republican administration, had been appointed as a special assistant to the President for atomic matters.

On June 5, less than a month before his term expired, lame-duck AEC Chairman Gordon Dean extended Dr. Oppenheimer's consultantship for one more year, to expire in June, 1954. On July 3, 1953, Lewis Strauss was appointed the new Republican Chairman of the AEC to succeed Gordon Dean. Four days later, on July 7, Strauss directed the Atomic Energy Commission to change the security procedures for handling certain classified documents that were in Dr. Oppenheimer's possession at the Institute for Advanced Study in Princeton. The documents were placed in a new facility at Princeton, though Dr. Oppenheimer still had access to them, under AEC supervision.

Borden began to have grave doubts of the adequacy of his action up to this point. "I felt . . . that I had not previously measured up to my duty in this matter. . . . After I left [the Congressional Committee], I took a month off and this matter pressed on my mind. The feeling grew upon me that I had not fully discharged what was required of me in view of the fact I had not taken a position."

On November 7, 1953, Borden addressed a letter to FBI Director J. Edgar Hoover. In it he outlined without evasion his own conclusions as to the evidence of Oppenheimer's activities over the years. Hoover sent it to the White House. "The purpose of this letter," Borden wrote, "is to state my own exhaustively considered opinion, based upon years of study of the available classified evidence, that more probably than not, J. Robert Oppenheimer is an agent of the Soviet Union."

President Eisenhower, after lengthy consultation with Strauss, the Secretary of Defense Charles E. Wilson, and Attorney General Herbert Brownell, directed that, pending a security review of the material in the file, a "blank wall" be placed between Dr. Oppenheimer and any secret data.

Lewis Strauss was on the point of departing for the Bermuda conference of President Eisenhower, Prime Minister Churchill, and French Premier Joseph Laniel when he received the President's instructions. He decided that, because of their long association, it was necessary for him to advise Oppenheimer of the Presidential action personally. Oppenheimer was in Europe at the time. Accordingly, Strauss postponed direct action.

Unknown to Strauss, the Defense Department got similar instructions from the White House and began immediately to put them into effect. By the time Strauss returned from Bermuda, it seemed clear that word of the governmental decision had reached Oppenheimer.

Oppenheimer arrived at the AEC building in Washington in response to the Chairman's invitation on the afternoon of December 21. Strauss carried out his painful duty. As Strauss remembers it, Oppenheimer asked whether security proceedings were necessary, whether they could not be avoided by his resigning his government contracts. Strauss replied that this was a matter on which Oppenheimer should be guided by counsel. Oppenheimer insists that it was Strauss who suggested resignation, but whichever version is correct, it is clear that he had this opportunity. Next day Oppenheimer signed a letter asserting he would answer the charges on which the White House action was based.

You put to me as a possible desirable alternative [Oppenheimer wrote] that I request termination of my contract as a consultant to the Commission, and thereby avoid an explicit consideration of the charges on which the Commission's action would otherwise be based. I was told that if I did not do this within a day, I would

receive a letter notifying me of the suspension of my clearance and of the charges against me, and I was shown a draft of that letter.

I have thought most earnestly of the alternative suggested. Under the circumstances this course of action would mean that I accept and concur in the view that I am not fit to serve this government that I have now served for some twelve years. This I cannot do. . . .

AEC General Manager K. D. Nichols, who attended the meeting between Strauss and Oppenheimer, wrote a memorandum for the record in which he recalled that it was Oppenheimer, not Strauss, who suggested resignation. But irrespective of which man was the author of the suggestion, it is clear that Oppenheimer could have avoided the security hearing that followed and chose not to.

Then, in accordance with the established procedures for investigating alleged security-risk cases in the U.S. Government, on December 23, 1953, General Manager Nichols wrote Oppenheimer notifying him that he had been suspended and that he was entitled to a hearing before a Personnel Security Board. The items of derogatory information in Oppenheimer's file were listed. Most of the charges dealt with Oppenheimer's earlier flirtations with known Communists, charges that had already been thoroughly investigated by the wartime Manhattan District. The second portion of the charges dealt with Oppenheimer's opposition to the hydrogen bomb.

Nichols wrote:

It was reported that in 1945, you expressed the view that "there is a reasonable possibility that it [the hydrogen bomb] can be made" but that the feasibility of the hydrogen bomb did not appear, on theoretical grounds, as certain as the fission bomb appeared certain, on theoretical grounds, when the Los Alamos Laboratory was started; and that in the autumn of 1949, the General Advisory Committee expressed the view that "an imagina-

tive and concerted attack on the problem has a better than even chance of producing the weapon within five years." It was further reported that in the autumn of 1949, and subsequently, you strongly opposed the development of the hydrogen bomb: (1) on moral grounds, (2) by claiming that it was not feasible, (3) by claiming that there were insufficient facilities and scientific personnel to carry on the development, and (4) that it was not politically desirable. It was further reported that even after it was determined, as a matter of national policy, to proceed with development of a hydrogen bomb, you continued to oppose the project and declined to cooperate fully in the project. It was further reported that you departed from your proper role as an adviser to the Commission by causing the distribution, separately and in private, to top personnel at Los Alamos of the majority and minority reports of the General Advisory Committee on development of the hydrogen bomb for the purpose of trying to turn such top personnel against the development of the hydrogen bomb. It was further reported that you were instrumental in persuading other outstanding scientists not to work on the hydrogen bomb project, and that the opposition to the hydrogen bomb, of which you are the most experienced, most powerful and most effective member, has definitely slowed down its development.

This lengthy and somewhat tedious statement of the charges regarding Oppenheimer's conduct in the matter of the thermonuclear program was broken into paragraphs by the *New York Times* in its publication of the text of Nichols' letter. The effect of paragraphing was to create the impression that here was a series of charges added on to the other charges in Nichols' letter. If this were true, of course, one of the charges against Oppenheimer, it could logically be held, was that he held a contrary opinion in government to the one that prevailed and was being tried for this opinion. Actually the paragraph was intended by the AEC to be a detailed statement of the single charge that he had attempted to delay or halt the development of the hydrogen bomb in his role as a government official, even after a Presidential decision had been made.

Nichols went on:

In view of your access to highly sensitive classified information, and in view of these allegations which, until disproved, raise questions as to your veracity, conduct, and even your loyalty, the Commission has no other recourse, in the discharge of its obligations to protect the common defense and security, but to suspend your clearance until the matter has been resolved.

Two and a half months later, on March 4, 1954, Dr. Oppenheimer replied to the Nichols charges in a long letter in which he stated that "the items of so-called 'derogatory information' set forth in your letter cannot be fairly understood except in the context of my life and my work." Then he followed with a summary of his life and work, in which he denied having been a Communist or ever having attended closed meetings of the Communist Party.

As for the hydrogen bomb, Oppenheimer wrote: "... the General Advisory Committee stated its unanimous opposition to the initiation by the United States of a crash program of the kind we had been asked to advise on. . . . I never urged anyone not to work on the hydrogen bomb project, I never made or caused any distribution of the GAC reports except to the Commission itself. . . ."

Oppenheimer requested a special hearing in his letter. Accordingly, a special Personnel Security Board was convened, under the chairmanship of Gordon Gray, former Secretary of the Army, then President of the University of North Carolina. The other members of the Board were: Thomas A. Morgan, former President of the Sperry Corporation, and Dr. Ward V. Evans, Professor of Chemistry, Loyola University of Chicago.

Just as the Board was convening, Senator Joseph McCarthy, who had also been sniffing at the edges of the Oppenheimer case for nearly a year, found himself in serious difficulties over charges that he had browbeaten the Army for special treatment for draftee G. David Schine, a former investigator for

his Senate Investigating Committee. Typically, McCarthy looked around for new ways of changing the subject. In a television address, using time that CBS commentator Edward R. Murrow had granted him for reply to an attack by Murrow, McCarthy charged the hydrogen-bomb program had been delayed eighteen months.

In a voice that trembled ominously, McCarthy demanded:

... If there were no Communists in our government, why did we delay for eighteen months, delay our research on the hydrogen bomb, even though our intelligence agencies were reporting day after day that the Russians were feverishly pushing their development of the H-bomb? And may I say to America tonight that our nation may well die, our nation may well die because of that eighteen-month deliberate delay. And I ask you, who caused it? Was it loyal Americans or was it traitors in our government? ...

Oppenheimer and his attorneys in less than a week, after McCarthy's sally, released the Nichols charges and Oppenheimer's reply. It was the day the hearings before the Gray Board began. The probity and integrity of the members of the Board were widely hailed in the press (until the majority reported, in any event). Most Washington correspondents breathed a sigh of relief that the case of the eminent physicist would be investigated in a judicial manner and not in the Roman-circus atmosphere of a Senate proceeding.

For more than six weeks, entirely in secret, and with its witnesses sworn to secrecy, the Board met in Washington. Forty witnesses, including Edward Teller, James B. Conant, I. I. Rabi, Enrico Fermi, Norris Bradbury, Gordon Dean, Hans Bethe, Robert Bacher, General Leslie R. Groves, T. Keith Glennan, Karl T. Compton, Jerrold B. Zacharias, George F. Kennan, Vannevar Bush, Sumner T. Pike, David E. Lilienthal, Lee A. DuBridge, John J. McCloy, John Von Neumann, Charles C. Lauritsen, appeared before the Board. More than 3,000 pages of testimony were given. In addition,

the Board studied another 3,000 pages of material in the files of AEC and other agencies.

On June 1, Dr. Oppenheimer's legal counsel released certain papers and letters pertinent to the case that showed that the Personnel Security Board had by a vote of two to one declined to reinstate Dr. Oppenheimer's security clearance.

In discussing the significance of its findings, the majority of the Board stated:

The Board has found the allegations in the first part of the Commission letter [which dealt with Oppenheimer's alleged Communist associations] to be substantially true, and attaches the following significance to the findings: There remains little doubt that, from late 1936 or early 1937 to probably April, 1942, Dr. Oppenheimer was deeply involved with many people who were active Communists. The record would suggest that the involvement was something more than an intellectual and sympathetic interest in the professed aims of the Communist Party. Although Communist functionaries during this period considered Dr. Oppenheimer to be a Communist, there is no evidence that he was a member of the Party in the strict sense of the word.

Using Dr. Oppenheimer's own characterization of his status during that period, he seems to have been an active fellow-traveler. According to him, his sympathies with the Communists seem to have begun to taper off somewhat after 1939, and very much more so after 1942. However, it is not unreasonable to conclude from material presented to this Board that Dr. Oppenheimer's activities ceased as of about the time he executed his Personnel Security Questionnaire in April, 1942. He seems to have had the view at that time and subsequently that current involvement with the Communist activities was incompatible with service to the government. However, it also would appear that he felt that former Communist Party membership was of little consequence if the individual concerned was personally trustworthy.

Dr. Oppenheimer's sympathetic interests seem to have continued beyond 1942 in a diluted and diminishing state until 1946, at which time we find the first affirmative action on his part

which would indicate complete rejection. In October, 1946, he tendered his resignation from the Independent Citizens Committee of the Arts, Sciences, and Professions, Inc., and he now says it was at this time that he finally realized that he could not collaborate with the Communists, whatever their aims and professed interests. We would prefer to have found an affirmative action at an earlier date.

The Board takes a most serious view of these earlier involvements. Had they occurred in very recent years, we would have found them to be controlling and, in any event, they must be taken into account in evaluating subsequent conduct and attitudes.

As for Dr. Oppenheimer's alleged opposition to the H-bomb, the Board report stated:

With respect to the second portion of General Nichols' letter the Board believes that Dr. Oppenheimer's opposition to the hydrogen bomb and his related conduct in the postwar period until April, 1951, involved no lack of loyalty to the United States or attachment to the Soviet Union. The Board was impressed by the fact that even those who were critical of Dr. Oppenheimer's judgment and activities or lack of activities, without exception, testified to their belief in his loyalty. . . .

We believe that, had Dr. Oppenheimer given his enthusiastic support to the program, a concerted effort would have been initiated at an earlier date.

Following the President's decision, he did not show the enthusiastic support for the program which might have been expected of the chief atomic adviser to the Government under the circumstances. Indeed, a failure to communicate an abandonment of his earlier position undoubtedly had an effect upon other scientists. It is our feeling that Dr. Oppenheimer's influence in the atomic scientific circles with respect to the hydrogen bomb was far greater than he would have led this Board to believe in his testimony before the Board. The Board has reluctantly concluded that Dr. Oppenheimer's candor left much to be desired in his discussions with the Board of his attitude and position in the entire chronology of the hydrogen bomb problem. . . .

In the course of the proceedings, there developed other facts which raised certain questions of such serious import as to give us concern about whether the retention of Dr. Oppenheimer's services would be clearly consistent with the security interests of the United States.

The Board stated its conclusions:

1. We find that Dr. Oppenheimer's continuing conduct and associations have reflected a serious disregard for the requirements of the security system.

2. We have found a susceptibility to influence which could have serious implications for the security interests of the country.

3. We find his conduct in the hydrogen bomb program sufficiently disturbing as to raise a doubt as to whether his future participation, if characterized by the same attitudes in a Government program relating to the national defense, would be clearly consistent with the best interests of security.

4. We have regretfully concluded that Dr. Oppenheimer has been less than candid in several instances in his testimony before this Board.

Dr. Ward V. Evans, the scientist member of the Board who dissented, wrote in a minority report:

His judgment was bad in some cases, and most excellent in others but, in my estimation, it is better now than it was in 1947 and to damn him now and ruin his career and his service, I cannot do it. . . . His statements in cross examination show him to be still naïve, but extremely honest and such statements work to his benefit in my estimation. All people are somewhat of a security risk. I don't think we have to go out of our way to point out how this man might be a security risk. . . . He did not hinder the development of the H-bomb and there is absolutely nothing in the testimony to show that he did. . . . I personally think that our failure to clear Dr. Oppenheimer will be a black mark on the escutcheon of our country. . . . This is my opinion as a citizen of a free country. . . . I suggest that Dr. Oppenheimer's clearance be restored. . . .

The Gray Board in its commendable attempt to think out loud for the benefit of the U.S. people and establish that it had not taken its responsibilities lightly wound up with a regrettable lack of focus.

The Washington working press and the fiercely independent columnists, with a singular lack of effort to get the whole story of the Oppenheimer case, seized on the Board's rhetorical weaknesses and joined the main body of the scientific community in damning the action of the Gray majority. It was on the whole a sharp exhibition of one of Washington's widely overlooked evils, handout journalism.

The columnists and the scientists were particularly disturbed by the Board's suggestion that an exaggerated security system, now in force in Washington, left it no choice except to find against Oppenheimer when in fact: "It seemed to us that an alternative recommendation would be possible if we were allowed to exercise mature practical judgment without the rigid circumscription of regulations and criteria established for us."

The Board added in the next paragraph, largely overlooked, that its alternative would have been to recommend that "Dr. Oppenheimer simply not be used as consultant." The Board also added that it had made inquiry on this point of the AEC and was advised that this alternative was not feasible, since other government agencies extended clearance on the basis of the AEC's clearance as well as all AEC contractors, who would "probably" have continued to use his services.

The Board had also gone to some lengths to declare Oppenheimer's loyalty to be beyond question and had added that he "seems to have had a high degree of discretion reflecting an unusual ability to keep to himself vital secrets."

Finally the Board seems to have suggested that the only part he played in the thermonuclear program after the President's decision was a failure to "show enthusiastic support." Many Washington correspondents demonstrably failed to find in

these particular paragraphs a straight line to the Board's conclusions.

The Board, however, had said of Oppenheimer's story on his role in the struggle over the hydrogen bomb: "The Board has reluctantly concluded that Dr. Oppenheimer's candor left much to be desired in his discussions with the Board of his attitude and position in the entire chronology of the hydrogen bomb problem."

On not one but two occasions the Board charged that Oppenheimer had been "less than candid." It also reported that he had admitted he had lied to security officers in his earlier accounts of an attempt during the Manhattan days to get him to give over atomic secrets to the Soviets.

The Board also noted that Oppenheimer had continued to have friendly relations as recently as four months earlier with this man, who by his earlier testimony had invited him to commit what amounts to a treasonable act.

The Board might specifically have stated that repeated failures to tell the truth, the whole truth, and nothing but the truth about matters of substance make any man a security risk of unknowable proportions. It was on the whole a generous report.

Following the decision of the Gray Board, Oppenheimer in accordance with the established procedure, appealed his case to the full Atomic Energy Commission. The AEC Commissioners, Eugene M. Zukert, Joseph Campbell, Thomas Murray, Henry deWolf Smyth, and Lewis Strauss, voted four to one to uphold the decision of the Gray Board. The lone dissenter was the scientist member of the Commission, Henry Smyth.

Three of the Commissioners, Zukert, Campbell, and Strauss, expressed their views in a majority report, which in part stated:

The Atomic Energy Act of 1946 lays upon the Commissioners the duty to reach a determination as to "character, associations and loyalty" of the individuals engaged in the work of the commission. Thus, disloyalty would be one basis for disqualification,

but it is only one. Substantial defects of character and imprudent and dangerous associations . . . are also reasons for disqualification. . . . Prior to these proceedings the derogatory information in the government files concerning Dr. Oppenheimer had never been weighed by any board on the basis of sworn testimony.

We find Dr. Oppenheimer is not entitled to the continued confidence of the government and of this commission because of the proof of fundamental defects in his "character." . . . The record shows that Dr. Oppenheimer has consistently placed himself outside the rules which govern others. He has falsified in matters wherein he was charged with grave responsibilities in the national interest. . . .

The work of the military intelligence, the FBI and the AEC—all, at one time or another, have felt the effect of his falsehoods, evasions and misrepresentations. Dr. Oppenheimer's persistent and willful disregard for the obligations of security is evidenced by his obstruction of inquiries by security officials. . . .

Dr. Oppenheimer's close association with Communists is another part of the pattern of his disregard of the obligations of security. Dr. Oppenheimer under oath admitted to the Gray Board that from 1937 to at least 1942 he made regular and substantial contributions in cash to the Communist Party. He has admitted that he was a fellow traveler at least until 1942. He admits that he attended small evening meetings at private homes at which most, if not all, of the others present were Communist Party members. He was in contact with officials of the Communist Party, some of whom had been engaged in espionage. His activities were of such a nature that these Communists looked upon him as one of their number. . . . We find that his associations with persons known to him to be Communists have extended far beyond the tolerable limits of prudence and self-restraint. . . . These associations have lasted too long to be justified as merely the intermittent and accidental revival of earlier friendships.

Commissioner Murray concurred in the majority decision (thus making the vote four to one against Oppenheimer) but he went further and declared that Oppenheimer was "disloyal." He stated:

The primary issue is the meaning of loyalty. . . . The idea of loyalty has emotional connotations; it is related to the idea of love, a man's love of his country. However, the substance of loyalty does not reside solely in feeling or sentiment. It cannot be defined solely in terms of love. The English word "loyal" comes to us from the Latin adjective "*legalis*" which means "according to law." . . . To be loyal in Webster's definition, is to be "faithful to the lawful government or to the sovereign to whom one is subject." This faithfulness is a matter of obligation; it is a duty owed. This general definition of loyalty assumes a sharper meaning within the special conditions of the present crisis. The premise of the concrete, contemporary definition of loyalty is the fact of the Communist conspiracy. . . .

On the domestic front this problem has been met by the erection of a system of laws and executive orders. . . . American citizens who have the privilege of participating in the operations of the government, especially in sensitive agencies, are necessarily subject to this special system of law. Consequently, their . . . loyalty must be judged by the standard of their obedience to security regulations. . . . This security system is not perfect in its structure or in its mode of operation. Perfection would be impossible. . . . Those who are affected by the system have a particular right to criticize it. But they have no right to defy or disregard it.

The record of [Oppenheimer's] actions reveals a frequent and deliberate disregard of those security regulations which restrict a man's associations. He was engaged in a highly delicate area of security; within this area he occupied a most sensitive position. The requirement that a man in this position should relinquish the right to the complete freedom of association that would be his in other circumstances is altogether a reasonable and necessary requirement. . . . It was particularly essential in the case of Dr. Oppenheimer. It will not do to plead that Dr. Oppenheimer revealed no secrets to the Communists and fellow travelers with whom he chose to associate. What is incompatible with obedience to the laws of security is the associations themselves, however innocent in fact. . . .

Those who stand within the security system are not free to refuse their cooperation with the workings of the system, much less to confuse or obstruct them, especially by falsifications and

fabrications. . . . This cooperation should be active and honest. . . . No matter how high a man stands in the service of his country he still stands under the law. . . . It was reasonable to expect that [Oppenheimer] would be particularly scrupulous in his fidelity to security regulations. These regulations are the special test of the loyalty of the American citizen who serves his government in the sensitive area of the atomic energy program. Dr. Oppenheimer did not meet this decisive test. He was disloyal.

The lone dissenter, Commissioner Smyth wrote:

Since Dr. Oppenheimer is one of the most knowledgeable and lucid physicists we have, his services could be of great value to the country in the future. Therefore, the only question being determined by the AEC is whether there is a possibility that Dr. Oppenheimer will intentionally or unintentionally reveal secret information to persons who should not have it. . . . There is no indication in the entire record that Dr. Oppenheimer has ever divulged any secret information. . . .

The conclusion drawn by the majority from the evidence is so extreme as to endanger the security system. . . . If a man protects the secrets he has in his hands and his head, he has shown essential regard for the security system. . . . In these times failure to employ a man of great talents may impair the strength and power of this country. Yet I would accept this loss if I doubted the loyalty of Dr. Oppenheimer or his ability to hold his tongue. I have no such doubts.

The decision of the Gray Board and the AEC Commissioners will undoubtedly be argued for years to come. In any case, with the decision, Dr. Oppenheimer's services as an adviser to the United States Government came to an end.

Chapter 22

TWO ATOMIC COLOSSI

"Noting what in actual fact men have said about what they thought, who it was that thought it, and why he thought it, one finds, as in all history, that the contingent and the unpredictable, the peculiar greatnesses and blindnesses of individual men play a determining part...."

—J. R. OPPENHEIMER, *Science and the Common Understanding*

THE OPPENHEIMER CASE reached the proportions of a national debate in the early summer of 1954. It centered largely over the findings of the Gray Board and its rhetorical weaknesses, whether Dr. Oppenheimer was "un-enthusiastic," whether he was "discreet," whether he was "loyal." In one sense it was a pointless debate. Since there was no affirmative evidence that his motives were base, it was necessary to assume, as the Gray Board assumed, that they were of the highest.

The Oppenheimer case was indeed painful to fair-minded Americans and damaging to the nation's prestige, coming as it did at a time when the issue of "loyalty" and "security" was badly obscured by the demagoguery of Senator McCarthy. But perhaps the pain was a necessary reminder of the obliga-

tions a people as fortunate as the Americans have to the idea of freedom.

The plain fact was that on a question of overriding importance Dr. Oppenheimer was wrong, tragically and frightfully wrong. Repeatedly the point was made in Dr. Oppenheimer's behalf that it is not criminal to be wrong. That is undebatable. It is not criminal to be wrong about the weapons of the atomic age, only fatal. Whether Oppenheimer was guided or misguided would have been of no importance had the West learned that Communist Russia possessed the ultimate weapon, after the U.S. had decided not to build it. The Kremlin would have been free to dictate its terms to the world. Not only would the U.S. have lost both liberty and its way of life; the U.S. would have been, as Mr. Churchill suggested, guilty of murdering freedom.

It was an accident bordering almost on the miraculous that the nation had working in its atomic weapons laboratory, where he could pit both his knowledge and his determination against Dr. Oppenheimer, a man like Edward Teller. It is remarkable at the very least that the man who had the genius to build the hydrogen bomb was also a man impelled by the belief it should be built.

The United States cannot afford to court more such close calls with destiny. They will come readily enough in the course of events in spite of our utmost vigilance.

Possession of the thermonuclear bomb holds no answers in itself and shows no way to a decent future. It simply prevents an immediate end to the future. The United States, certainly along with its allies, was caught in the unhappy stalemate President Eisenhower described in his memorable speech to the U.N. on benign uses of atomic energy. Yet it is inescapable that two atomic colossi are doomed for the time being "to eye each other malevolently across a trembling world." It can only be said that better this than a single atomic colossus—the Soviet Union—eying a trembling world.

It is patently not enough to keep abreast of the weapon

itself in the atomic age. The ability to deliver it is of the first rank of importance. Major revolutions in the order of warfare now occur with dizzying speed. The turbojet engine and the nuclear explosive were parallel developments. It was as if the ancient Hittites had rolled into Egypt not only on wheeled chariots but armed with machine guns. At the peak of the war in Europe, warfare's fastest pace was the 300-mile-per-hour speed of the propeller aircraft. Its mightiest blow was the five-ton TNT "blockbuster." By the end of the war against Japan, the punch was the 20,000 tons of TNT equivalent of the atomic bomb. Speed had stepped up to the 500 miles per hour of the early jet aircraft. Shortly after the turn of the half century, the pace of warfare exceeded the speed of sound; its punch had reached the force of 45 million tons of TNT.

In the years immediately ahead, it is unlikely that the power of the weapon will again take a quantum jump, but it is almost certain that the method of delivery will. This is where the U.S. and its free allies must expect their next close call with destiny. The inhabited aircraft seems on the very edge of obsolescence as the decisive military weapon. The uninhabited aircraft, or guided missile, is certainly just ahead. To maintain the balance of power, the U.S. must make this critical transition from bomber to missile in time. Under no circumstances can it afford a delay comparable to the delay in building the H-bomb—some four years.

Once a nation's offensive fleet (today it is bombers; tomorrow it will be missiles) is destroyed, war in the thermonuclear age for all practical purposes is over. Depending on the fiber of the people under attack it might continue for months, or conceivably even years. But the "war" would consist only of a progressively melancholy annihilation of the urban population of the resisting nation. It seems doubtful that any people actually could survive the shock of say 1,000 "obsolete" 500-kiloton bombs. It seems more than probable that no people could survive if one substitutes in the equation the potential 45 megatons of the thermonuclear bomb.

Almost all thinking military men agree that the slow mobilizations of past wars are a thing of the past. The attacking forces—or defending forces—will never be stronger than they are on A-day, H-hour. Surprise is a priceless ingredient. An attacker exploiting surprise to the fullest could in one raid hope to destroy both the enemy retaliatory force and his entire industrial establishment.

But, as in warfare from the beginning of time, the element of risk remains in the equation. No battle has ever gone according to plan. An atomic attack probably falls into this generalization. Now the risk is greater than ever before, just as the possibility for quick success is greater. If the defender's striking forces survived to retaliate, a mistake in an atomic war would be mutually fatal. In this geometrical jump in the element of risk there may be some hope for the future, though grim hope it is.

At any time in the year 1954, the U.S. Strategic Air Command had the capability, if the President of the United States issued such an order, to rain down complete urban annihilation on the Soviet Union. Literally within two hours after the first SAC bomber penetrated the Soviet early-warning system, the U.S.—if everything went according to plan—could put 1,000 atomic bombs of 500 kilotons' force on Soviet targets. The bombers would penetrate simultaneously from around a 17,000-mile perimeter, into the 350 million cubic miles of air over the U.S.S.R. The possibility of the Red Air Force blunting this attack in any appreciable degree is remote.

Within another year after 1954 most of the bombs in such a raid would be not 500-kiloton bombs but thermonuclear bombs of at least 15 megatons' force. One thousand Soviet targets wiped from the face of the earth would leave little else to hit even in such a vast land.

None of these bizarre statistics should hold false assurances for Americans. Within only a few years or even less the Red Air Force, SUSAC, must be conceded the same capability against the U.S.

The horror of this monstrous balance of potential annihilation led many of the U.S. atomic scientists who knew its implications from the beginning to seek some spiritual, almost mystical remedy. Unhappily they sought something that did not yet exist and in their frantic search almost destroyed the balance.

A strong case can be made that war is inevitable until a single state controls the earth. Oppenheimer's chief accuser, William Borden, challenges the mutual-deterrent thesis in his discussion of the revolution in strategy. Borden argues:

The fallacy of the mutual deterrent thesis was tested with particular thoroughness before the first World War. From 1870 onward the development of conscript armies, huge dreadnoughts and automatic gunfire filled men's minds with an apprehension similar to that engendered by the atomic bomb. Then, as now, the world stood in the vestibule to a new era in military history. The consequences of a general war were unpredictable and therefore the statesmen of that other day set up a world court and held conference after conference to iron out international differences. The atmosphere was relatively ideal for "cooperation," "friendliness" and "mutual understanding between peoples." Hatreds were keyed low because wars were localized since Waterloo. Totalitarianism, together with fifth columns, propaganda and iron curtains, was an international abrasive as yet undeveloped. The leading revolutionary doctrine was still democracy, and the rights of men. But come the war did, in spite of everyone's fear of retaliation. Even Germany delayed mobilization three days while the Kaiser exchanged peace overtures with the Russian Czar. War came because then, as now, the great powers were sovereign units struggling in anarchy.

Borden may be right, but he wrote before the thermo-nuclear bomb replaced the atomic bomb and created another new order of magnitude in the technique of killing.

Quantum mechanics demonstrates that in nature the future cannot be predicted by a projection of the past. There may be a point at which this same principle can be applied to the

affairs of men. It may be that the horror of war did not deter it in the era of the Kaiser and the Czar, but something monstrously new has been added. Winston Churchill's tired eyes may have seen it when he said on November 3, 1953, in the House of Commons:

Indeed, I have sometimes the odd thought that the annihilating character of these agencies may bring an utterly unforeseeable security to mankind. . . . It may be . . . that when the advance of destructive weapons enables everyone to kill everybody else, no one will want to kill anyone at all. At any rate, it seems pretty safe to say that a war which begins by both sides suffering what they dread most—and that is undoubtedly the case now—is less likely to occur than one which dangles the lurid prizes of former days before ambitious eyes.

There is only one choice for the United States, a hard one indeed. It must keep itself ready, ready for whatever may come, without hysteria and above all with courage. This is not to suggest that freemen should stand paralyzed before the specter of hydrogen war. The Soviets, for example, do not. They serve their dynamics everywhere, press at every weakness of the non-Communist world to advance their revolution. Frightened neutralism, the Munich psychology, could be the undoing of the West. The case of the European neutralist is absurd at the outset. London, Paris, Rome are not on the front line of hydrogen war. The unenviable position is held by New York, Washington, Philadelphia, Los Angeles, Seattle, Chicago, and Detroit, if it is held by any large city. It would be madness for the Soviets to drop the first hydrogen bomb on a western European city. Before they could strike again, their own homeland would be burned out. If the hydrogen bomb destroys western Europe, it will be by the paralyzing effect of fear, not in the fusion of atomic nuclei. Stalin once told former U.S. Secretary of State George C. Marshall that the Soviets desired peace just as the Democracies desired peace, but the Democracies feared war more. This is the historical

advantage of the bully. If the free peoples stand in awe of a hydrogen bully, their freedom will die just as certainly as though it had been killed in hydrogen war.

For the free world, life must go on. If the main threat and burden of the hydrogen age falls on the United States, the main effort to create the circumstances that will truly end the threat and lift the burden should be made by the U.S. A sense of this necessary responsibility of a great power has underlain U.S. postwar policy, but the effort has manifestly been inadequate. The Marshall Plan, Point Four, offshore procurement, dollar aid in its various forms, have been at best emergency measures to prevent the economic collapse of western Europe. But it seems quite clear they have not been enough. Something far more creative must come from the United States.

Life, in an editorial entitled "An Agenda for the Hydrogen Age," suggested on April 12, 1954:

It is a desperate world of survival which requires us to be steadfast, but it also requires us to be politically creative, so that this world can change.

What kind of change? The H-bomb won't tell us. We had better consult the same long hopes and bold dreams we had before it came. Americans have a considerable nonmilitary agenda, both at home and abroad, for the improvement of the human lot. It includes the spread of economic freedom and the raising of real incomes throughout the free world, a start toward which was outlined in the Eisenhower economic message [of the previous week]. It includes making our farm policy rational and pacifying the Middle East. It includes the spread of hospitals and schools, of roads and houses, of justice and law. The H-bomb, far from interrupting this agenda, ought to lend us sobriety and resolution in working on it. The avoidance of a hydrogen war is merely a precondition of civilized life, not a substitute.

President Eisenhower, the first U.S. President of the hydrogen age, has an unparalleled opportunity to fashion a U.S. policy for the new era that will meet the unparalleled demands on

it. Reliance on the old formulas was certain to fail. If a world economic policy founded on nothing more basic than reciprocal trade agreements was inadequate in the preatomic age, it was doubly inadequate in a hydrogen age.

The U.S. and its allies must pursue their political and economic ends. They must be creative at all costs. They must pursue a steadfast statecraft, yielding neither principle nor territory to the bully's threats. They may have to fight more "little" wars, such as Korea, to make this resolve clear, and they must be always on guard against the big one.

Certainly they must use every talent and energy to prevent, if they can, the fulfillment of Pandit Nehru's image of the atom: "The genie that came out of the bottle, ultimately swallowing man." In this direction, the atom itself holds forth the greatest hope. Despite the incredible slowness of the effort, the U.S. now has ample know-how to derive useful energy from the nuclear reaction. It cannot produce electrical power from atomic heat as cheaply as power can be produced from coal at Pittsburgh. But power can be produced more cheaply from the atom in Wyoming or southern Italy or in the Middle East than it can be from coal in these coal-short areas. President Eisenhower made no idle offer in his U.N. speech, and the world can expect real progress from the United States in this area.

The limitation in present know-how is the fact that useful energy can only be extracted from the fission of uranium. Uranium is not a cheap fuel. Of greater significance, in the same direct ratio that the H-bomb overshadows the A-bomb, would be production of useful energy from the far more productive thermonuclear reaction.

It is already known that such a process is not clearly beyond human ingenuity, as Dr. Oppenheimer's General Advisory Committee blithely held in the fall of 1949. It is also true, however, that the problem is formidable. The thermonuclear reactions begin at heats far below the hundreds of millions of degrees that trigger the hydrogen bomb. This is the result of a

nuclear phenomenon known as quantum leakage. But even so, the reactions do not begin before temperatures are reached that approximate the sun's interior and that would vaporize any physical arrangement of the elements known on earth. The reaction is too hot for any known container, as we now think of a container.

All images are subject to change, however; just as the Newtonian image of a picturable universe had to give way to Einstein's mostly unpicturable universe, so will the concept of a simple container have to give way in the thermonuclear age. If the concept can be mastered, useful energy will be available to man on a scale that could produce significant changes in the mean standard of living on earth. Power might easily become so cheap that it would not be metered. It literally would be available to distill and pump water to turn the desert green.

All of these things are visions of the future, probably a generation or two away. Yet, in the long stretch of time, they are immediately at hand. In Edward Teller's extraordinary vision, they are literally in sight.

Certainly the outcome of the race between thermonuclear annihilation and thermonuclear plenty is not so clear as to offer no alternative but despair.



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